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The Andean Group's Common Technology Policy:
A Political-Economic Analysis

by

W. Brent Copley, B.A. (Honours)

(c) 1984

A thesis submitted to the Faculty of Graduate Studies
in partial fulfilment of the requirements
for the degree of
Master of Arts

The Norman Paterson School of International Affairs
Carleton University
Ottawa, Ontario
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"THE ANDEAN GROUP'S COMMON TECHNOLOGY POLICY:

A POLITICAL-ECONOMIC ANALYSIS"

submitted by W. Brent Copley, B.A. Hons.

in partial fulfilment of the requirements for
the degree of Master of Arts

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ABSTRACT

Since the late 1960s, increasing academic and practical attention has been focused upon attempts by less-developed countries (LDCs) to institute policies designed to increase their degree of technological self-reliance. Unfortunately, studies of such attempts generally fail to analyze adequately the complex mixture of political-economic factors which underly the adoption of technology policies.

This thesis endeavours, as far as possible, to fill this gap, looking at one concrete example, the Andean Group's common technology policy. It begins by outlining a possible framework for a political-economic analysis, and then uses this framework in an historical analysis of the common technology policy. Special attention is given to the Group's major policies related to regulation of technology imports and promotion of local technological activities.

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CHAPTER I : GENERAL INTRODUCTION

A. INTRODUCTION

Over the past two decades, a number of less-developed countries (LDCs) have initiated policies designed to improve their position with regard to technology. Recognizing the importance of technology to social and economic development, and the structural weaknesses facing LDCs in their attempts to acquire technology -- whether via "transfer" from the advanced industrial countries (AICs), or through domestic innovation -- various LDCs have attempted to frame policies for increased technological self-reliance. One of the foremost of these attempts is the common technology policy adopted by the Andean Group countries (Bolivia, Colombia, Ecuador, Peru, Venezuela and, until 1976, Chile). The Andean Group policy has attracted considerable attention, for two principal reasons: first, its subregional, as opposed to national, character, which offers a possible solution to the problems posed by the small market size and limited technological infrastructure of most LDCs; and second, the far-reaching nature of the policy initiatives proposed, which encompass both control of technology imports and promotion of local technological capabilities.

As the number of practical attempts to devise LDC technology policies has risen, so too has the level of academic interest in the subject, with much of the attention being focused on the Andean Group experience. In all too many cases, however,

technology policies are analyzed merely as rational responses to a series of objective problems confronting LDCs in the realm of science, technology and production. Such an approach tends to neglect the socio-economic forces and actors which influence the adoption and implementation of these policies, thus ignoring the political-economic context of policy decisions. As a result, the vast majority of studies to date concentrate on two questions: why should LDCs adopt explicit technology policies; and, what should be the content of the policies adopted? While this approach is understandable, and to some degree inevitable, it leaves a crucial third question unanswered: what brings LDC policy-makers to a recognition of the need for explicit technology policies? An examination of this question takes us beyond a mechanistic analysis of the policies themselves, toward a study of the societal determinants of LDC technology policy.

This thesis analyzes the Andean Group's common technology policy from a "political economy" perspective -- i.e., one which stresses the link between political decisions (e.g., technology policies) and the interplay of socio-economic forces and actors. It is argued here that the nature of the original Andean Group policy, and changes in the Group's policy over time -- whether through the introduction of new policies, the revision of old ones, or the failure to implement existing policies -- are best explained by analyzing changing political-economic conditions in the subregion. Three types of factors are important:

- i) contextual factors -- i.e., changes in the "environment" of the policy process, related to both

global economic conditions, and the broad effects of other national or subregional policies;

ii) indirect actors -- i.e., changes in the attitudes or relative strengths of the various classes and/or pressure groups which influence the policy process; and

iii) direct actors -- i.e., changes in the nature of policy-makers themselves, particularly (in the case of the Andean Group) the various member governments.

Changes in these three sets of factors allow us to identify three periods in the historical evolution of the Andean Group technology policy: a period of expansion, from 1969 until 1974; a period of relative stagnation, from 1974 until 1980; and, since 1980, a period of apparent rebirth, albeit under a philosophy significantly different from that which guided the original technology policy.

The issues dealt with in the thesis, it should be stressed, are of both policy and theory. At the policy level, the thesis uses the Andean Group example to illustrate some of the constraints placed upon LDC initiatives in the field of technology policy by changing political-economic conditions. At a more theoretical level, the thesis illustrates the need for and usefulness of a political economy approach to the study of LDC policy-making with regard to technology.

The thesis is divided into six chapters. The remaining sections of this introductory chapter present a brief outline of the Andean Group's common technology policy, and definitions of some of the terms used in the thesis. The next chapter defines the theoretical background to the study: first, it examines the

relationship between technology policy and economic development; and second, it presents a possible framework for a political-economic analysis of the Andean Group policies. The third chapter examines the forces and actors supporting and opposing the Andean Group policy, and outlines the three stages in the evolution of the policy mentioned above. The analysis is carried to a more concrete level in Chapters IV and V, which deal respectively with Andean Group policies related to the regulation of technology imports, and the promotion of local technological activities. In the final chapter, conclusions are drawn and suggestions made for future research. The thesis then closes with a discussion of the possible future evolution of the common technology policy.

B. THE ANDEAN GROUP'S COMMON TECHNOLOGY POLICY

While elements of the common technology policy were approved as early as 1970, it was not until 1974 that Decision 84 ("Bases for a Subregional Technology Policy") set out the fundamentals of the Group's activities in this field. According to the Group's Junta (its main technical body), the primary goal of the common technology policy, as set out in Decision 84, is the reduction of technological dependence, and the attainment of a significant degree of technological self-reliance: "Contrary to dependence and distinct from autarky, the Andean Pact's goal in the field of productive knowledge is the progressive attainment of a significant degree of technological autonomy"

(JUNAC, 1976a, 3). Decision 84 and the principles embodied in it remain the centrepiece of the common technology policy. As will be pointed out in Chapter III, however, recent proposals have called for reforms to both the areas of action of the common technology policy, and (to a lesser degree) its objectives.

The overall policy comprises a wide variety of initiatives in various fields. It is possible, however, to isolate two primary areas of activity. First, there are those policies related to the importation and assimilation of technology. The primary activity here is Decision 24 ("Common Treatment for Foreign Capital and Trademarks, Patents, Licensing Agreements and Royalties"), approved in 1970, which provides for the registration and regulation of direct foreign investment (DFI) -- itself an important vehicle for the transfer of technology -- and technology contracts (e.g., licensing agreements). Also important is Decision 85, passed in 1974, which outlines a common system of industrial property rights. Finally, in recent years three further policy initiatives in this field have been developed. First, there is the program of "technological disaggregation" (i.e., breaking up technology requirements into components, rather than importing integrated "packages" of inputs from a single supplier); second, an intensified international search for alternative technology suppliers; and third, a project designed to carry out inventories of subregional technological capacities in selected sectors. To date, activities in these areas have been limited to pilot projects in the petrochemical,

engineering, assembly, and construction sectors (JUNAC, 1979c, 16-21; JUNAC, 1983b, 7-8).

The second primary area of action is the creation and adaptation of technology within the subregion, and the application of technology (whether imported or developed locally) in productive activities. Two programs are important in this regard. First, there are the Proyectos Andinos de Desarrollo Tecnológico (PADTs), or Andean Technological Development Projects; these are specific projects initiated to perform concrete technological activities in certain sectors or issue areas. Second, technological activities form an important part of the Group's industrial programming policies, via the Programas Sectoriales de Desarrollo Industrial (PSDIs), or Sectorial Industrial Development Programs. While both the PADTs and the PSDIs affect the entire range of technology policy activities, they have two main purposes: the creation and adaptation of technology, and the fostering of links between technology policy institutions and the productive sector. As will be shown later, this latter objective is important in creating demand for local technological activities.

While these two categories comprise the primary elements of the common technology policy, there are also several subsidiary activities. One activity which has long been supported by the Junta is the creation of an information system to support other activities. While both Decision 24 and Decision 84 called for such a system, it was not until 1980 that the

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Sistema Andina de Información Tecnológica (SAIT), or Andean Technological Information System, was established. Also important are activities related to financing and training. In the Andean Group, these functions are largely handled by two semi-autonomous bodies: the first by the Corporación Andina de Fomento (CAF) or Andean Development Corporation; and the second, by the Convenio Andrés Bello, or Andrés Bello Agreement, which deals with science, education and culture. In the interests of simplicity, the activities of these two bodies are not dealt with in this thesis, and financing and training programs are discussed only insofar as they form part of other policy initiatives.

C. DEFINITIONS

At this point, it is necessary to define some of the terms used in this thesis; other terms (e.g., technological dependence, technological self-reliance) will be defined within the body of the thesis, as they arise.

In the first place, there is the concept of technology itself. Definitions of the term abound, but one of the most concise is that offered by Norman Girvan (1979, 1): technology, he states, is "the knowledge, skills, methods and procedures associated with the production and utilization of goods and services in a given society." The important point here is not so much the precise wording of the definition, but rather the distinction between technology and goods which embody technology: technology does not refer to machinery and goods, but rather to

the knowledge and skills which are used to produce them, and which is often embodied within them. In addition, it is also crucial to distinguish between science and technology: science, according to Francisco Sagasti (1977, 3), consists of "basic and applied knowledge which cannot be used directly in productive activities"; technology, on the other hand, while not merely "applied science" -- nor, as Frances Stewart (1977, 1) points out, necessarily related solely to the production of concrete goods -- has a more practical connotation, dealing with the production and use of goods and/or services.

Second, it is necessary to clarify the meaning of "technology policy." Essentially, the term refers to the ensemble of government or inter-governmental directives, regulations and plans which deal directly or indirectly with the acquisition and use of technology. Again, however, precise definitions are less important than distinctions between terms. First, there is the issue of explicit and implicit technology policy. According to Sagasti (1978, 28), the body of government policies whose main aim is to affect the development, acquisition, adaptation and use of technology (explicit technology policy) constitutes only one element of overall technology policy; also important is implicit technology policy -- those government policies which, while primarily directed toward other issues, have an indirect influence on technology-related activities. In the Andean Group, for example, the PADTs are an element of explicit technology policy;

industrial programming via the PSDIs, on the other hand, represents an element of implicit technology policy. In this thesis, primary attention is focused on explicit policy instruments, although an understanding of implicit policy instruments is essential to certain parts of the analysis.

A distinction should also be made between "formal" and "effective" technology policy. The former term refers only to the legal and institutional framework of technology policy, while the latter emphasizes the way in which policies are implemented, not only by government agencies, but also within productive enterprises, whether public or private. Finally, it is necessary to distinguish between "regulatory" and "programming" policies: according to the Junta, the Andean Group's technology policies are divided between activities whose main aim is regulatory (e.g., Decision 24, Decision 85), and activities related to the programming of technological activities (e.g., PADTs) (JUNAC, 1979c, 5). As will be seen later, this distinction has important consequences for the patterns of support for various policy instruments.

CHAPTER II : THEORETICAL BACKGROUND

A. INTRODUCTION

Studies of LDC technology policy generally proceed from an analysis of the role of technology policy in fostering economic development, and then design policy proposals to fulfil this role. As a result, the questions which these studies address are essentially normative and descriptive: they discuss why LDCs should adopt explicit technology policies, and what types of measures should be included in these policies. This emphasis is both understandable and useful, and has produced a large body of information dealing with the design of LDC technology policies. Unfortunately, this approach neglects certain critical issues. In particular, traditional analyses of LDC technology policy have only limited explanatory and predictive value: they cannot explain why and how theoretical statements regarding the need for explicit technology policy are translated into concrete political action, nor where (i.e., under what political-economic conditions) explicit technology policies are most likely to be adopted. A thorough analysis of LDC technology policy, whether in the Andean Group or elsewhere, must thus rest on twin theoretical pillars: on the one hand, a conception of the role of technology policy in economic development; and, on the other hand, an understanding of the social and political determinants of LDC technology policy.

This chapter attempts to outline these two "pillars" as

they relate to the Andean Group's common technology policy. The first section analyzes the role of technology policy in economic development, concentrating upon that body of theory which underlies the Andean Group policies. The second section attempts to define the second theoretical "pillar" by outlining a possible framework for a political-economic analysis of the Andean Group's technology policies.

B. TECHNOLOGY POLICY AND ECONOMIC DEVELOPMENT

Robert Seidel (1974, 4-8, 20-45) has attempted to outline the historical evolution of Latin American theories regarding science and technology policy by reference to two "modes of analysis" which he claims have guided both theoretical statements on the subject, and practical attempts to devise policies, over the past several decades: the "liberal scientific" and "techno-economic" approaches (1). Seidel's analysis has been adapted by Sagasti (1979, 24-25), who adds a third "mode," which he labels the "growth advocate" approach. While each of the modes is sufficiently broad to contain significant variants, and while they rarely occur in pure form (Seidel, 1974, 4), the modes can be said to define three consecutive periods in the evolution of Latin American theories on technology policy and economic development. While this evolution is perhaps most obvious at the level of academic debate, it is also reflected in the changing Latin American policy environment.

In the years preceding and immediately following World War

11, the growth advocate approach generally held sway. It is less prevalent today, although proponents of this type of approach can still be found, not only among "liberal" economists, but also among some Marxist scholars (e.g., Arghiri Emmanuel) who question the wisdom of LDC efforts to develop indigenous technological capabilities (2). The predominant concern of this approach is economic growth; growth advocates are unwilling to sacrifice this goal, even partially, for the development of an indigenous science and technology capability. As Sagasti (1979, 24) states:

. . . growth advocates do not award science and technology any distinct role of their own in the development process. They view technology as a mere input into the process of economic growth, and do not care at all about its origin. Either through open hostility or benign neglect, growth advocates oppose the idea that the acquisition of an indigenous science and technology capacity is an integral component of the development process.

The growth advocate approach, then, is essentially a theoretical justification for the absence of explicit science and technology policies in LDCs.

The earliest attempts to frame national science and technology policies in Latin America began in the late 1940s, as some of the larger countries instituted national research councils as organs of state science policy (Seidel, 1974, 20-21). These initiatives were based largely upon the liberal-scientific mode of analysis. Two characteristics of this approach are particularly important. First, liberal-scientific analysts envision only a limited government role in the field of science

and technology. Despite the contention of Sagasti (1979, 23-24), this is not because liberal-scientists are interested solely in "science for its own sake"; unlike growth advocates, liberal scientists do see science and technology as factors which can contribute to development. However, they adopt a primarily "laissez-faire" attitude, feeling that science, left to develop relatively freely, will inevitably help foster a wider process of socio-economic development. There is seen to be little need for explicit policies on science and technology: those policy initiatives which are required, are concerned primarily with "pure" science rather than technology, and act almost entirely on the "supply side," particularly via funding of research and development (R&D) (Seidel, 1974, 22). Second, the liberal-scientific approach stresses the importance of securing flows of technology from the advanced industrial countries (AICs), with little or no recognition of the possible negative consequences of technology transfer (Seidel, 1974, 22). In fact, the liberal-scientific approach rests on the implicit assumption that there is no qualitative distinction between the situation of LDCs and AICs with regard to science and technology, and that LDCs can thus foster the development of an indigenous scientific and technological base through a process of "technological borrowing" from AICs. It is assumed that a relatively open market for scientific and technological information provides easy access to the accumulated knowledge of the AICs, and that the basic similarity of LDC and AIC requirements ensures ease of

assimilation of "borrowed" technology.

During the 1960s, the techno-economic approach began to gain currency, forming the basis not only for an expansion of the activities of existing science and technology bodies (Lavados, 1979, 142-144), but also for the development of a wide variety of new institutions and policies: for example, the ITINTEC (Instituto de Investigacion Tecnologica Industrial y Normas Tecnicas, or Industrial Technology Institute) system in Peru; technology transfer regulations in Argentina, Colombia and Mexico. This approach began largely as a negative reaction to indiscriminate technology imports fostered by earlier approaches to science and technology policy (Sagasti, 1978, 8), and differs from these earlier approaches in several important respects: techno-economists emphasize technology over pure science; they are more concerned with the terms and conditions of technology transfer, and more aware of its possible adverse effects, than earlier theorists; and finally, they favour an expanded government role in science and technology planning, including measures to promote demand for local technological activities.

The shift to the techno-economic paradigm to a certain degree parallels a shift in development theory more generally. At the same time that new approaches to technology policy were being devised, the linear development theories of Rostow and others -- which had placed faith in market forces and emulation of AICs -- were progressively losing credence, at least in academic circles. New approaches (e.g., structuralist and

dependencia theories) stressed the existence of "active" barriers to development, rooted in local social conditions and global economic forces; expressed skepticism regarding the possibility and advisability of "copying" AIC experience; and favoured expanded government planning for development. In a sense, the expansion of technology policy activities under the techno-economic paradigm resulted from the growing recognition of the complexity of development itself: as development became more complex and multi-faceted, so did the policies (technological or otherwise) designed to foster it.

It is this techno-economic approach which underlies the Andean Group's common technology policy, as outlined in Decision 84. Indeed, some of the foremost techno-economic theorists (Constantine Vaitsos, Francisco Sagasti, Miguel Wionczek) have been associated with the Andean Junta, and the work of this body has been instrumental in defining some of the tenets of the techno-economic approach (e.g., policies to regulate technology transfer, theories of technological disaggregation) (JUNAC, 1976b). In the following pages, the central characteristics of the techno-economic approach are examined, paying particular attention to Andean Group policies and activities.

B.1. Theoretical Background : Technological Dependence and Technological Self-Reliance

The techno-economic approach takes as its starting point the concepts of technological dependence and technological

self-reliance. Technological dependence cannot be equated with a mere propensity to import technology. Rather, like dependence in general, it is the result of an asymmetrical power relationship (domination - subordination) between productive structures in AICs and LDCs, which arises as a result of the historical evolution of the capitalist world economy (3). In this case, the "power" involved is that related to the development and use of technological knowledge. LDCs are unable to develop an indigenous technological base adequate to their needs, not simply because of the low level of pre-existing technique, but more importantly because of the active penetration of LDC economies by AIC economic interests, and the adoption by dominant classes in LDCs of AIC cultural values and consumption patterns, both of which orient the economy toward external sources of technology. As a result, LDCs do not "choose" to import foreign technology; rather, technology becomes an instrument of domination, and LDCs are in a sense "locked into" a relationship in which they are highly reliant upon imported technology -- usually from a limited number of suppliers (Stewart, 1977, 116) -- and in which local adaptation of imported technology is rare. In opposition to technological dependence is the concept of technological self-reliance. Self-reliance in this case is not equated with a condition of autarky (i.e., a refusal to import any foreign technology whatsoever) (Sagasti, 1975, 169-170). Instead, it refers to a strategy to overcome the negative effects of technological dependence, through the maximization of LDC "decision autonomy" with regard to technology:

. . . it is not necessary to possess the technology within the economy to meet the development needs of the country. Decision autonomy refers to the capacity for defining technology requirements, identifying alternatives available elsewhere (breaking them into their components) and determining the best way to acquire, incorporate and absorb the technology (Sagasti, 1976, 939).

Indeed, even in its most extreme form, technological self-reliance refers only to the potential for total reliance on indigenous technology, not the fact of such reliance (Sagasti, 1976, 940).

Although the techno-economic approach draws upon dependency analysis, its understanding of dependency is not identical to that proposed by the more radical dependencia theorists. As Seidel (1974, 18) points out, proponents of science and technology policies are, with few exceptions, "reformers and gradualists," who envision a process of change within existing social structures. Thus, while the explicit purpose of the Andean Group's technology policy (as mentioned in Chapter I) is the attainment of a degree of technological self-reliance, this is to be achieved not by radical structural change, but rather by policies which work to aid local business interests (the "national bourgeoisie") in competition with foreign economic interests (TNCs, technology suppliers). According to Seidel (1974, 61), the Andean Group's science and technology policy "is, at least at the rhetorical level, oriented toward providing national business with the instruments for industrial growth, and moving their countries away from such deep

dependency on foreigners and the MNCs" (see also Campbell, 1979, 214; JUNAC, 1979c, 5). In a sense, then, the "implicit" aim of the Andean Group technology policy is to foster the growth of a national bourgeoisie capable of developing indigenous scientific and technological capabilities. While Seidel's comments refer to policies regulating technology transfer, the same could also be said about other elements of the common technology policy.

B.2. The Need for Explicit Technology Policy

In keeping with the tenets of dependency analysis in general, the techno-economic mode asserts that the situation of LDCs with regard to technology is qualitatively different from that which faced the now industrialized countries during their industrialization process. In the first place, LDCs are now subject to distorting influences on their economies which were not relevant to the experience of countries which industrialized at an earlier date (e.g., the influences of TNCs, the demonstration effect of AIC consumption patterns). In addition, Bhatt (1975, 653-656) argues that the process of technological change facing LDCs is different from that which faced countries industrializing in the nineteenth or early twentieth centuries. First, technological change is now largely science-based, whereas in earlier periods it was based primarily on "artisan ingenuity and learning-by-doing experience" (Bhatt, 1975, 653); as a result, transfer and assimilation of technology was much easier in the earlier era (4). Second, while technological innovations

in the nineteenth century pertained largely to the machinery and intermediate goods crucial to an industrialization process, LDCs now face a situation in which technological innovation is more frequently oriented toward the production of consumer goods which are often inappropriate to LDCs (5).

As a result, it is concluded that if LDCs are to attain a significant degree of technological self-reliance, they cannot adopt the type of "laissez faire" attitude toward technological development followed by the industrialized countries, and proposed by earlier theories of science and technology policy. Instead, there is a need for explicit policies in the area of technology, and thus an increased role for government. As Seidel (1974, 45) says:

The techno-economic paradigm for Latin American development is a long-term view of state stewardship of entrepreneurial development, through direct and indirect policy instruments, as a key to industrialization and the necessarily related scientific and technological development.

This is reflected, for example, in the Andean Group's Decision 84, which argues that "programming is an essential requirement for technological development" (Decision 84, Preamble; see also JUNAC, 1976a, 11-12).

B.3. Supply and Demand Factors

While earlier approaches concentrated upon the need to increase the supply of technological inputs (via either technology transfer or, less frequently, the promotion of local

R&D), the techno-economic approach argues that if LDCs are to develop a viable technological base, attention must also be focused on demand factors. This position arises from a conviction that, as Herrera (1974, 27) states, "modern science [and the same can be said for technology] . . . only develops where there is some effective demand for it from society." LDCs typically face two problems in this regard: not only do productive structures -- particularly those which benefit from high levels of protection -- have little interest in technical innovations to decrease cost or improve productivity, but that demand for technological innovation which does exist is often oriented toward foreign suppliers (Halty-Carrere, 1973, 70-71).

As a result, there has been a call for policies to promote an increased "effective demand" for local technological innovation. Many of the policy instruments useful in this regard are instruments of general economic policy, which affect science and technology only implicitly (e.g., industrial programming, industrial financing, state purchasing policies, export promotion, etc.) (Sagasti, 1978, 72-76), but explicit technology policy instruments are also important. For example, policies to control technology imports, such as the Andean Group's Decision 24, play a role in orienting demand toward local technology suppliers.

The primary purpose of all these instruments is, either directly or indirectly, to forge a link between scientific and technological institutions (technology suppliers) and productive

structures (technology users). Unless such a link is forged, technology which is developed within LDCs will never be put to use, and the activities of technological institutions will be limited by their reliance on the outlay of public funds. Unfortunately, as Girvan (1979, 32-33) notes, there is a certain danger involved in tying technological activities to demand emanating from the productive (i.e., private) sector. Just as a failure to promote such "demand linkages" promotes R&D which is divorced from the needs of the productive sector, so too close reliance on demand from the private sector risks orienting R&D to the actual pattern of effective demand for productive activity rather than the potential pattern of demand. As a result, priorities for technological development will be set by the market, raising the danger that needs which do not find expression in the market will be largely ignored. (This point is developed further in Chapter V.) As mentioned in Chapter I, both the PADTs and the Andean Group's industrial programming policies are meant to establish links between technology institutions and the productive sector.

9.4. Control of Technology Imports

One of the central tenets of the techno-economic approach is a recognition of the need to control the importation of technology. Policies with regard to the import of technology (e.g., Decision 24) are not designed to cut off the international flow of technology, but rather to foster a process of selective

importation, allowing LDCs to obtain maximum benefit from the technology they do import. The policies have their theoretical basis in a body of theory concerning the market for imported technology, most closely associated with the work of Constantine Vaitsos (Vaitsos, 1975; 1976; 1979). Vaitsos begins from the contention that technology is not a freely transferred good, but rather a commodity which is bought and sold ("commercialized") like any other (6). The market for technology facing LDCs, however, is a highly imperfect one, for three main reasons. First, the supply of technology is concentrated not simply in the AICs, but in a few corporations (TNCs) within these countries; as a result, technology suppliers wield considerable monopoly/oligopoly power (Vaitsos, 1975, 185). Second, several characteristics of technology itself impede the functioning of normal market mechanisms (Vaitsos, 1975, 190-191). These can be summarized as follows:

i) since technology is usually sold in embodied form, it is difficult to separate the market for technology from the market for goods, services and personnel which embody that technology;

ii) prospective buyers of technology lack sufficient information regarding the characteristics of the technology to be purchased to allow them to make an educated decision; this is largely because the technology to be purchased is information, and thus prior information cannot be provided by the supplier; and,

iii) the sale of technology does not reduce its availability to the supplier; as a result, the marginal cost of supplying a technology already developed is practically nil (7), although its worth to the recipient (especially a technology-poor LDC) may be very great. Thus, it is difficult to establish a "fair" price for imported technology.

Third, the "limited initiative" (Vaitos, 1975, 185) of LDCs in searching for alternative technology suppliers exacerbates the problem of concentrated supply noted above.

LDC technology purchasers thus face a market for imported technology in which price is set not by the forces of supply and demand, but rather through a bargaining process between supplier and purchaser (Vaitos, 1975, 191). As a result of the imbalance in bargaining power between small LDC purchasers (firms or countries) and large technology suppliers (often TNCs) in the AICs, suppliers are able to extract substantial monopoly rents, increasing the cost of technology to the purchaser, and also to include restrictive clauses (export restrictions, requirements to purchase intermediate goods from the supplier, etc.) in technology contracts. Explicit action by LDC governments is seen as a means to increase the bargaining power of LDC technology purchasers.

According to Sagasti (1977, 9-10), three specific policies are important in this regard, all of which have been undertaken by the Andean Group. First, LDCs must engage in a more active international search for technology in order to uncover all potential suppliers. Second, rather than importing a package of technological inputs from a single supplier, LDCs must learn to "disaggregate" or "break up" the technology package (Vaitos, 1979, 102), and then decide upon the most appropriate supplier (local or foreign) for each element. In addition to improving bargaining conditions by diversifying supply, this will promote

greater demand for local technological activities. Finally, action is needed to register and control all technology contracts, in order to decrease cost and reduce restrictive conditions. This last policy, as Chudnovsky (1981, 134) points out, rests on the assumption that because of the price inelasticity of supply of imported technology, the monopoly rents of suppliers can be "taxed" without decreasing supply.

B.5. Co-ordination of Explicit and Implicit Policies

Another element of the techno-economic approach is the co-ordination of the explicit and implicit elements of technology policy. As was mentioned in the introduction, "effective" technology policy consists of both explicit policy instruments, and the implicit effects on technology of general economic policies. As Sagasti (1977, 5) notes, "it is imperative to emphasize and deal with the implicit content of technology policy and of other development policies, seeking to eliminate possible contradictions, and to make different policies reinforce each other and form a coherent whole." The Andean Group has endeavoured to do just that, but, as will be shown later, coordination of policies has been a recurrent problem for the Group.

B.6. The Need for Joint Action

Since technological self-reliance is often not feasible for individual LDCs -- owing to small market size, limited

technological infrastructure, and shortages of human and financial resources -- the techno-economic approach also favours joint action by LDCs in the field of technology (Sagasti, 1976; Sagasti, 1975, 170-178; Halty-Carrere, 1973, 64-78). Regional or international co-operation is in particular valued as a means to increase the bargaining power of LDCs vis-a-vis technology suppliers. In addition to informational weaknesses, the bargaining power of individual LDCs is limited by their typically small market size, which renders them marginal purchasers with little leverage over technology suppliers; co-operation or integration, by increasing effective market size, helps to overcome the imbalance in negotiating power between supplier and purchaser. In addition, co-operation can help achieve the minimum "critical mass" necessary for the performance of some technological activities where economies of scale are important (Sagasti, 1976, 943). Co-operation should also bring about a rationalization of technological resources (e.g., educational facilities, research institutes), thus avoiding unnecessary duplication of efforts. As Sagasti points out, however, such co-operative efforts will be fully successful only if they form part of an overall process of economic and political co-operation (Sagasti, 1976, 943).

C. TOWARD A POLITICAL ECONOMY APPROACH

There can be little doubt that the Andean Group's common technology policy, as outlined in Decision 84, rests squarely

within the "techno-economic" mode of analysis outlined above. The Andean Group policies thus rest upon a relatively well-developed theoretical basis, particularly in terms of their conception of the role of technology policy in fostering economic development. In comparison with earlier approaches, the techno-economic paradigm arises from a more coherent body of theory regarding the relationship between technology policy and economic development, and comes to a more complete recognition of the complexity and multiplicity of policy initiatives required. The emphasis of the techno-economic approach on the external constraints to the development of a local technological capacity, the importance attached to demand factors, and the recognition of the need for government planning of science and technology development stand out as particularly significant improvements over earlier approaches.

On the other hand, there is a fundamental methodological similarity between the three approaches outlined earlier. As mentioned at the beginning of this chapter, all proceed from an analysis of the role of technology in economic development, and then design policy instruments to fill this role. As a result, policies are seen as rational, deliberate responses to objective problems facing LDCs in their attempts to build a viable technological base. Intellectual conflicts over the design of technology policies are admitted, but conflicts between underlying social forces and actors, related to the adoption and effective implementation of technology policies by states, are largely brushed over. Three more specific points stand out.

First, in most cases, little attempt is made to assess the impact of policies on specific groups/classes within LDCs; instead, it is implicitly assumed that technology policies will benefit the "nation as a whole," or at least will not have substantial negative effects on any group(s) which could endanger the implementation of these policies. Second, it is assumed that the state apparatus, and the interests which underly it, support the goals of proposed technology policies: according to Saqasti (1978, 8), traditional approaches "assumed implicitly that the state apparatus represented the interests of nationalistic groups oriented toward self-reliant development." Finally, the problems of policy implementation are treated in a highly mechanistic fashion. This tendency can perhaps be linked to the prevalence during the early 1970s of the "systems analysis" approach to science and technology policy, which attempted to devise an ideal planning methodology applicable in any situation (8).

Overall, then, there has been a tendency toward "isolating the problem from its determinants" (Amadeo, 1979, 151), with LDC technology policies analyzed without reference to the forces and actors which influence, directly or indirectly, the adoption and implementation of these policies (9). The reasons for this are not entirely clear. The primary reason may be that most research regarding LDC technology policy has been "action-oriented" (Oldham, 1980, 13-14) -- that is, the clients for this research have been LDC policy-makers themselves. As a result, studies have focused upon the design of policies, rather than upon the

interrelationships between these policy proposals and the groups/classes which influence the policy-making and policy-implementation process. Whatever the reasons for this "slant" in the literature, its effects cannot be denied. In particular, as was remarked earlier, studies to date have little explanatory or predictive value. Mytelka (1979, 21) underlines this point with reference to the Andean Group's policies to regulate technology transfer and direct foreign investment:

To argue that there is a logical need to regulate technology transfer within regional integrative systems, and to suggest that some individuals within regional secretariats or academic milieux saw that logic, is not to explain the conditions under which such measures will be adopted, or the precise nature of regulatory policies actually approved.

The same can be said for the Group's technology policy in general: to say that the Andean Group's policies rest upon a "sound" theoretical basis, supported by various experts, is not to explain the forces which led to the adoption and implementation of these policies, or the intricacies of the policies themselves.

Thus, there is a need for a new approach to the study of the Andean Group's technology policies, which stresses the political-economic "determinants" of these policies, and the obstacles to their adoption and implementation. It is in this spirit that the rest of this chapter attempts to outline a possible "political economy" approach to the problem -- i.e., an approach which explicitly emphasizes the link between political decisions (in this case technology policies) and the interplay of

socio-economic forces/actors. Such an approach, it must be noted, does not seek to refute earlier work on LDC technology policy, but rather to extend the usefulness of such research by acting as a complement to it.

C.1. Precursors of a Political Economy Approach

Unfortunately, there has been little work to date on the political-economic bases of LDC technology policy. In the late 1960s and early 1970s Herrera drew attention to the extent to which science policies reflect the interests of socio-economic elites in LDC society, and the limits placed upon scientific and technological development by the development models perpetuated by these elites (Herrera, 1974). In the early 1970s, O'Donnell and Sabato proposed a study of Argentinian science and technology institutions (STIs), looking explicitly at "the insertion of STIs in the societal context" (O'Donnell and Sabato, 1972, 3; see also O'Donnell, 1972). More recently, in an as yet unpublished paper on Peruvian technology policies, Worthington (1983) argues that the condition of technological dependence itself has reduced the ability of the Peruvian state to devise and adopt policies to overcome this dependence. For the most part, however, there have been only sketchy references to the interest or lack of interest of some social groups in technology policies, with few attempts to devise a coherent framework for an analysis of these interests. Herrera (1983, 5) argues that while much effort has been expended to analyze the nature and causes of the

technological backwardness and dependence of LDCs, "the body of theories and knowledge so developed has not been adequately used for a better understanding of the political, social and cultural determinants of science policy."

If we turn to the Andean Group's technology policy specifically, the situation is similar. There has been no comprehensive analysis of the common technology policy from a "political economy" perspective, and most of the information available is contained in partial studies, dealing only with certain actors or influences, and analyzing only certain elements of the overall policy, usually Decision 24. Vaitos (1983, 99-115), for example, analyzes the influence of transnational corporations (TNCs) on specific Andean Group policies, including some elements of the common technology policy. Ferris (1979a, 97-99; 1979b) provides some useful data on national support for Decision 24, although she emphasizes almost exclusively those provisions which deal with direct foreign investment (DFI). More importantly, the analysis deals only with "national" positions, brushing over the possibility of conflicts among the various group/class interests which constitute the components of a "national" position. Seidel (1974, 3-10) analyzes two types of conflicts which he feels have affected the Andean Group policies: first, conflicts between various intellectual "streams" on the subject of technology policy; and second, institutional conflicts, both among Andean Group institutions and between these and national science and technology bodies. Unfortunately, in

stressing these factors, Seidel relegates other influences more pertinent to the present analysis (e.g., the problems of achieving national consensus regarding science and technology policy, the influence of international linkages) to a secondary level of importance (Seidel, 1974, 157-164). Moreover, Seidel's analysis is weakened by its age, since it was written before Decision 84 outlined the full scope of the proposed policy.

The most authoritative study to date on the political economy of the Andean Group's technology policies is that by Mytelka (1979). Drawing upon the work of Vaitos (1973, 625), Mytelka argues that the adoption by LDCs of measures to regulate DFI and technology transfer is intimately linked to the rise of the national bourgeoisie in LDCs, and its growing competition with international capital:

. . . national adoption of measures to regulate direct foreign investment and the transfer of technology within a capitalist framework is likely to occur where there exists a national bourgeoisie that has attained critical mass, is conscious of its weakness and its need for state support -- where such consciousness is in turn a function of its experience with MNCs and where the national bourgeoisie is intimately linked to the state (Mytelka, 1979, 23).

Unfortunately, the framework outlined by Mytelka has two drawbacks from the perspective of the present analysis. First, it concentrates upon Decision 24, with other elements of the overall Andean Group technology policy given relatively less emphasis. Second, by concentrating upon the broad influences of local and foreign capital, the approach runs the risk of

neglecting the mechanics of the policy formulation process itself, operating instead at a relatively "abstract" level of analysis.

Thus, previous studies of the political-economic bases of the Andean Group technology policy -- or LDC technology policies in general -- provide, at best, a partial framework for the present analysis. Nor do more general studies of the Andean Group solve the problem. While some attention is paid to support for technology-related policies in general studies of the Andean Group (e.g., Ferris, 1979a, 97-99; Puyana de Palacios, 1982, 181-203; Tironi, 1978c, 277-281) and in studies of individual member countries (e.g., Avery, 1976; CINDA, 1974; Jedlicka and Rubenstein, 1979; Sherman, 1973), none of them provides a useful model for a political economy analysis of the Andean Group common technology policy.

Essentially the studies can be divided into two groups. Most follow what might be called an "actor-interest" approach: the policy process is seen as one of negotiation among various actors, with support for and/or participation in a given program dependent upon the degree to which it furthers that actor's interests. Studies of this type vary primarily in terms of the types of "actors" included in the analysis: some confine themselves to an analysis of negotiations among national governments (Ferris, 1979a); others pay attention to both sub-national actors (e.g., business and labour groups) and external actors (e.g., foreign governments, TNCs) (Alcalde, 1982;

CINDA, 1974; Puyana de Palacios, 1982); finally, some studies analyze the role of institutional actors, stressing the part played by the Andean Group institutions themselves in the policy process (Middlebrook, 1978).

This approach has two important weaknesses. First, by emphasizing the actors in the policy process, the studies often neglect the impact of contextual factors related to global and local economic conditions and policies. Second, most of these studies suffer from an unclear conception of the nature of the state in Andean societies, and of its role in the integration process. In particular, these studies fail to explain how various societal interests find expression within the state apparatus, or why certain interests have greater relative access to state power than others. Instead, the state is treated as simply another actor (and a homogeneous one) in the integration process (Bernaies, 1974b, 218), or as the relatively neutral "arbiter" of other interests (Rodriguez, 1974, 144-152). Moreover, no distinction is made between the state apparatus (the governmental and administrative machinery of the state) and the state itself -- understood, as O'Donnell (1978, 24) argues, as including not only a set of institutions, but also "the network of relationships of 'political' domination activated and supported by such institutions."

The capitalist state -- in the Andean subregion or elsewhere -- is a complex phenomenon. The state (or more properly the state apparatus) is neither independent nor neutral,

but, as various authors have pointed out (10), tends to reflect selectively the views and interests of certain groups within society, usually those of the business elite or bourgeoisie. While there are obvious differences among the various Andean nations, owing to their particular social formations, this general situation is reproduced in all the countries of the subregion. As will be argued later, what is at work here is an "unequal structure of representation," with business interests having greater relative access to the state apparatus than other groups (e.g., labour, peasant producers, consumers, etc.) (Mahon, 1979, 169-174; see also Poulantzas, 1969). Care must be taken, however, not to adopt a rigid "dominant class" analysis, in which the state apparatus is seen as a mere instrument of the business elite or bourgeoisie. As O'Donnell (1977, 51-52) points out, "instrumentalist" conceptions of the state, whether from Marxist or non-Marxist perspectives, ignore the fact that the state is itself "a societal factor, endowed with varying, but rarely insignificant, capabilities for autonomous impulse or initiative." Thus, the state apparatus is neither wholly independent, nor is it without a degree of "relative autonomy" from its own class/interest group base. To take one example, Bamat (1983), criticizing an earlier study by Dore and Weeks (1977), argues that the "Velasco regime in Peru, while responding to the interests of the industrial bourgeoisie, was in no way "controlled" by this class (Bamat, 1983, 128-134; see also Gorman, 1982b, 1-2).

The second, less conventional, "stream" within general studies of the Andean Group emphasizes the importance of certain "contextual factors" as influences on the policy process. According to Mace (1981, 20-21) and Tironi (1978c), Andean Group policies can be seen as the product of interactions among the various national development strategies of the Andean countries, and between these strategies and the economic development "model" proposed by the founders of the Andean Group. A country's support for, or participation in, any specific element of the integration process is influenced not only by a weighing of economic costs and benefits, but also by the degree to which the policy in question "meshes" with the country's development strategy (Mace, 1981, 18; Tironi, 1978c, 256). As a result, a deciding factor in the success or failure of any integrative system is the degree of consensus among national development strategies and the model of integration being proposed.

This approach also exhibits certain weaknesses. In particular, the approach, like the actor-interest one, fails to explain adequately the ways in which societal interests influence government policy. Although Mace and Tironi do mention underlying social forces and actors, there is a tendency in the approach to treat development strategies as (in some sense "given," neglecting the interests which lie behind them. Development strategies, however, are largely the result of past and present government policy, and must themselves be seen as products of particular political-economic conditions. In a

sense, the approach is a mono-causal one: in stressing the impact of national development strategies, Mace and Tironi neglect not only underlying societal actors, but also other types of contextual factors, such as those related to the evolving conditions of the global economy. Like other mono-causal approaches (e.g., the contention of Puyana de Palacios (1982) that policy conflicts in the Andean Group spring from differences in the level of economic development of the member countries), the approach followed by Mace and Tironi is at best a partial explanation of the policy process in the Andean Group.

Of course, not all general studies of the Andean Group fit neatly into these two categories. The Vaitzos (1983) article mentioned earlier, for example, is an indispensable analysis of the influence of TNCs on the Group. Petras and Morley (1978), trace the rise of the Andean Group, and particularly Decision 24, to the advent of nationalist regimes in the Andean countries during the late 1960s and early 1970s. While such studies are useful, they do not provide a model for the present analysis, but simply insights which can be used to help construct such a model.

C.2. A Possible Political Economy Framework

Given the inadequacies of previous analyses, there is an evident need to construct a framework for a political-economic analysis of the Andean Group's common technology policy. The framework proposed for the present study consists of analysis at three levels:

- i) contextual factors;
- ii) indirect actors (underlying social forces); and
- iii) direct actors in the policy process.

At each level, it must be stressed, it is important to look not only at the various influences on the common technology policy, but also at the way these influences have changed over time.

C.2.a. Contextual Factors

To begin at the broadest level of analysis, it is first necessary to deal with various contextual factors which influence the policy-making process. Four categories of contextual factors are important for the present analysis. First, there are those factors related to broad changes in the world economy -- for example, commodity price trends, international lending and debt conditions, or shifts in AIC demand as a result of recessionary contraction. Second, there are those factors which relate to changes in the nature of technology, such as the growing importance of science-based, research-intensive technologies (e.g., micro-electronics, bio-technology). Third, there is a certain "demonstration effect" of policies adopted in other geographic areas (e.g., the rise of OPEC, or of export-oriented growth strategies in South-East Asia). Finally, an influence is also exerted by past and present economic policies at the national and subregional level; in other words, there is a certain amount of "feedback" from national and Andean Group policies, which either promotes or discourages activity in the

field of technology policy. In particular, it must be remembered that since the common technology policy represents part of a larger process of subregional integration, agreement or disagreement on other integrative policies will affect the Group's technology policy, and vice versa.

Such factors influence the decision-making process in three principal ways. First, they influence the perceptions and attitudes of actors (both direct and indirect) in the policy process, structuring the preferences and bargaining positions they bring to policy-making debates. Second, changing contextual factors (particularly those related to local and global economic conditions) affect the relative strengths of the various groups/classes which constitute the indirect actors in the policy process, and thus their ability to influence the outcome of this process. Third, they set the parameters within which policies, if they are to be successful, must be framed (i.e., successful policies must recognize the limits posed by contextual factors). Contextual factors thus affect policies indirectly, through their influence on the policy-making environment. As a result, their impact is less easily assessed than that of other factors, although it is equally important. Moreover, contextual factors do not necessarily have equivalent effects on all actors in the policy process, nor is the timing of these effects necessarily the same in all member countries.

C.2.b. Indirect Actors

The second level of analysis deals with underlying "social

forces" (i.e., classes or interest groups). Like contextual factors, the influence of these groups is largely indirect, in that it springs from their ability to influence those actors with a direct role in the policy process. While a number of such "indirect actors" exist, only the various business groups, local and foreign, can be said to exert a decisive influence on Andean Group technology policies.

The influence of labour (as well as other groups -- peasant producers, consumers, the Church) is limited by two factors. First, as mentioned earlier, there is a structure of unequal representation at work: labour groups have relatively little access to state power as compared with business interests, owing to the general weakness of working class political movements, and the financial constraints upon their ability to influence the state apparatus (11). Second, the influence of labour and other groups is limited by the nature of policy debates in the Andean Group. Debates in the Andean Group generally (and more specifically on technology policy issues) have focused on economic policy, often neglecting aspects of social policy, which are usually of more concern to labour (Vaitos, 1978, 725). Moreover, according to Bernales (1974b, 227), the technical, economic language of discourse regarding Andean Group policies has reduced popular interest and influence, converting the debates into "something about which experts, technocrats, planners and industrialists, etc., talk, but about which workers have neither an opinion nor a concrete feeling of

participation." This point can be expected to hold particularly true for technology policy debates: Vaitos (1983, 109) notes that the "specialized and esoteric" nature of Decision 85 (regarding industrial policy) meant that "it was not easily understood by the wider public opinion in the Andean countries." Of course, labour groups do from time to time express an opinion on "technology-related" issues -- Camacho (1975, 233-236), for example, mentions a 1970 meeting of union leaders in Santiago, Chile, at which they stressed the need for the creation and use of employment-generating technologies in the Andean Group -- but their general position has been one of neutrality and indifference (Camacho, 1975, 232). This attitude of neutrality, however, is itself an important "stand" on technology policy, with important effects, especially as it leaves the decisive rôle to the forces of national and international capital.

Local and foreign capitalists, on the other hand, have both access to state power, and an interest in technology policy debates. In the first place, the same structure of unequal representation which limits labour's access to the state apparatus provides such access for business interests. While, as mentioned earlier, other groups do have some influence on government policy, there is often a highly symbiotic relationship between Andean states and domestic and/or foreign capital (12). To take just one example, Hurtado (1980, 180-181) argues that the political influence of the Ecuadorian bourgeoisie has been constant, with relatively "institutionalized" representation in the

government and on various quasi-legislative boards, etc. Of course, conflicts among various "fractions" of the business class mean that it is not always the same group which wields political power in the Andean countries. Second, since, as mentioned above, the implicit purpose of the Andean technology policy (at least in its initial stages) was to favour an expanding domestic bourgeoisie in competition with foreign capital, it can be expected that both local and foreign business groups would have definite interest in, and opinions on, technology policy issues. As will be pointed out in the next chapter, however, facile generalizations regarding business attitudes are open to serious question.

Several additional points should be made regarding the role of indirect actors in the Andean Group policy process. First, in addition to the actors mentioned above, at least one other class of indirect actors -- foreign governments and international institutions (e.g., the IMF) -- can play a role, although this is usually in support of other groups, particularly foreign capital (13). Second, indirect influences are felt largely at the national level, owing to the lack of regionally-organized interest groups in the Andean subregion (Middlebrook, 1978, 71-72). This may be changing, however, as a sense of community spreads through the subregion: a recent article notes the formation of the Confederacion Andina de Pequenos y Medianos Industriales (Andean Confederation of Small

and Medium Businesses), representing some 25,000 enterprises throughout the subregion (IL, julio de 1983, 56-57).

C.2.c. Direct Actors

An analysis of the final set of factors -- direct actors -- demands a brief examination of the mechanics of policy formulation in the Andean Group in matters relating to technology. Within the Andean Group, technology policy proposals generally originate in the Junta, and more specifically in its technology policy working group. The Junta is the Group's technical secretariat, and is composed of appointed officials with (in theory at least) no national allegiances. Proposals are discussed in the Andean Commission, a political body composed of representatives of each member government. If approved by the Commission, the original proposal takes the form of a Decision. At this point, there is a crucial difference between "regulatory" and "programming" policies: while most programming activities are not subject to ratification by national legislatures (except indirectly, through their control over budget contributions), regulatory policies must usually be incorporated into national legislation. Application of many important technology policy decisions (Decision 24, Decision 85) is thus left entirely in national hands (Mytelka, 1979, 34-35).

Given the nature of this policy process, few groups or institutions can be said to have a direct influence on the Group's technology policies. First, the various "social forces"

outlined in the previous section have relatively little direct access to the policy-making process. While both business and labour groups do have de jure input via their membership on the Comité Asesor Económico y Social (CAES), or Economic and Social Advisory Council, this body has few real powers (Alcalde, 1982, 36; IL, abril de 1983, 66-67) (14). Even where business interests (or, less frequently, other groups) have a direct role as a result of their control of key government positions, the direct influence of these groups is secondary to their influence as indirect actors. Second, opposition political parties at the national level, and the national bureaucracies, have only a limited role. Regulatory policies, of course, afford these groups a greater degree of direct input than is the case for programming policies, because of the need for incorporation into national legislation. Even here, their impact on "formal" technology policy is limited to approval or denial, since they cannot directly propose amendments which would affect the group as a whole; they can, however, have a major impact upon "effective" technology policy, in that they can change the nature of corresponding national legislation, and thus affect the implementation of Andean Group policies. Nonetheless, this role should not be exaggerated. In many cases, Andean Group policies are implemented at the national level through simple executive order, with no legislative debate. In Colombia, for example, a debate over the constitutionality of Decision 24 was resolved by granting the president authority to approve the statute by decree

(Puyana de Palacios, 1982, 185). Moreover, in many cases, legislatures play only a minor role in the national political process, owing to strong -- and sometimes dictatorial -- executive power (15). The role of member-country bureaucrats is weakened further by the fact that most elements of the Group's technology policy were drafted by the Junta without significant input from national science and technology bodies -- which in the cases of Bolivia and Ecuador did not even exist until the late 1970s (JUNAC, 1983c, 4). While these national bodies have been granted a greater role through the 1982 creation of the Consejo Andino de Ciencia y Tecnologia, an advisory body on technology policy (JUNAC, 1983b, 6), the extent of their role is still presumably minimal. Finally, other than the Junta, few Andean institutions have an independent, direct influence on technology policies: the Commission is comprised of representatives of national governments, and other institutions (the Andean Parliament, the above-mentioned "Consejo") are too new and weak to have dramatically affected technology policies (16).

Thus, the two primary direct actors are the member governments (or more precisely, the various national executives) (17), and the Junta. To shift to a dynamic analysis, the main direct influence on Andean Group technology policies over time results from changes in these two types of direct actors. Of the two, changes in national governments have the most decisive influence. As an institution, the interests of the Junta and its technology policy group can be expected to be relatively constant

(i.e., support for expanded technology policy activities), although changes in personnel can have a certain effect on the theoretical orientation of these bodies, and thus on the type of policies proposed. Changes in the personnel of the Junta cannot, however, be seen as independent events. Since the members of the Junta are appointed by the Commission (which is itself made up of member-country representatives), and, according to Fontaine (1977, 24), are not without underlying national allegiances, changes in Junta personnel (or in the orientation of existing personnel) must be seen as largely the result of changes in other political-economic factors, particularly changes in national governments. It should also be stressed that not all changes in national government will have a crucial effect on national support for technology policy activities; instead, the major influence will result from what are best termed "regime changes," in which not only the personnel of government change, but also basic policy directions. Moreover, since the regime changes have occurred at different times in the various member countries, as important as the fact of these changes is the resultant degree of consensus among the member regimes: the extent to which member governments agree on broad issues of economic policy has a great impact upon the ability of the Group to agree upon more specific policy initiatives, including elements of the common technology policy.

One final point should be made regarding the influence of direct actors. While, as was noted in the previous two sections,

the positions of direct actors are influenced by other political-economic determinants (indirect actors, contextual factors), they are not completely determined by them. In order to avoid the type of rigid "dominant class" analysis criticized earlier, it is particularly important to recognize that national regimes can and do enjoy substantial "relative autonomy" from underlying social forces. The extent of this "relative autonomy," however, is not constant; instead, the influence of indirect actors is relatively weak when policy proposals are drafted and approved at the subregional level, and only becomes decisive at the stage of national ratification and implementation. There are two reasons for this: first, as mentioned above, business and labour groups lack substantial influence at the subregional level, owing to both the weakness of subregional pressure groups, and the structure of the Group's decision-making process; and second, as Puyana de Palacios (1982, 163-164) argues, those groups which are the "subject" of integration often only mobilize when the effects of Group policies become evident (i.e., after policies have been approved) (18).

D. CONCLUSION

Armed with this framework, it is now possible to undertake an analysis of the Andean Group's common technology policy from a political economy perspective. In the next chapter, the three political economic determinants outlined above will be used as a

basis for an historical analysis of the common technology policy. Changes in these three determinants, it will be argued, help to identify three stages in the historical evolution of the Andean Group's technology policies:

i) a phase of expansion, from 1969 to 1974;

ii) a phase of relative stagnation, from 1974 to 1980;

iii) a phase of apparent rebirth, from 1980 until the present.

To a certain extent, the political-economic changes affecting the common technology policy have affected other Andean Group policies, as well as economic policies in other Latin American countries. The stages of evolution of the common technology policy are thus partially (but not completely) analagous to stages in the development of the Andean Group as a whole (see, for example, Guerrero Cordero, 1979; Puyana de Palacios, 1982, 6-11), as well as to broad "periods" in recent Latin American history more generally. (see Chapter VI, Section B).

Finally, while it is possible to talk of the technology policy in general, this is to some degree an abstraction; the overall "common technology policy" contains a wide variety of policy instruments, each with different effects, and, therefore, different patterns of support. As a result, while the next chapter looks at the policy as a whole, Chapters IV and V isolate specific elements for more in-depth analysis, looking respectively at Decision 24 and the PADTs. These two elements have been chosen because they reflect two important distinctions

within the body of Andean Group technology policies: Decision 24 is a regulatory policy, with a primarily external focus (i.e., it deals primarily with technology importation), while the PADTs are an example of a programming activity, the main focus of which is internal (i.e., related to the local generation and use of technology). The format chosen for the two chapters is not strictly parallel. Chapter IV consists of a quantitative analysis of the attitudes of one group (the local industrial elite or national bourgeoisie) toward Decision 24. Support of this group is important for two reasons. First, because local and foreign business groups constitute the primary indirect influence on the common technology policy, and because foreign business interests have in many cases been hostile toward Decision 24 (see Chapter III), local business support is essential to ensure that legislation implementing Decision 24 is adopted at the subregional and national levels. Second, in the absence of such support, regulations, once instituted, may be side-stepped by local industrialists (e.g., through informal "gentlemen's agreements" with technology suppliers). Chapter V, on the other hand, takes a broader, but less quantitative, approach, examining probable links between the PADTs and an entire range of political-economic determinants. While this does mean that the findings of the two chapters are not completely comparable, it has the advantage of illustrating two different but complementary methods of structuring a political-economic analysis of LDC technology policies.

NOTES : CHAPTER II

(1) To a great degree, Seidel's two "modes" are analogous to the "supply side" approach to science and technology followed by UNESCO in the 1950s and 1960s, and the "demand side" approach emphasized by UNCTAD, the Andean Group, and various individual scholars (e.g., Francisco Sagasti, Constantine Vaitsos).

There are also, it should be noted, some problems with Seidel's classification. In the first place, Seidel's assertion that both liberal scientific and techno-economic theorists proceed from a belief in the need to reduce technological dependence (Seidel, 1974, 17) is open to some question. It is true that the liberal-scientific mode supports a minimalist conception of technological self-reliance (i.e., a desire to develop a local scientific base, rather than relying totally on foreign sources). However, no explicit connection is made between importation of scientific and technological knowledge and the underdevelopment of indigenous science and technology; indeed, in early liberal-scientific analyses, international flows of knowledge are seen as essential to the fostering of local science and technology efforts (Seidel, 1974, 20-25). As will be shown later, it was only as the techno-economic mode came to the fore that the issue of technological dependence came to be treated in a systematic way, and policies to combat technological dependence began to be framed. Second, it is possible to quarrel with Seidel's classification of some specific authors. In particular, his placement of writers such as Amilcar Herrera, Marcos Kaplan and Oswaldo Sunkel within the liberal-scientific mode (Seidel, 1974, 25-30) understates their role as critics, rather than proponents, of traditional analyses.

(2) I am grateful to Professor Lynn K. Mytelka for bringing this point to my attention.

(3) For a more complete discussion of the term technological dependence -- and the various ways in which it has been used -- see Cardettini, 1980, or Sagasti, 1980, 20-23.

(4) This point is open to some doubt. Recent studies have provided ample evidence of the importance of learning-by-doing and "technological apprenticeship" to technological change in LDCs. See, for example, Maxwell, 1980; Maxwell and Teubal, 1980.

(5) There is a parallel here to comments by Weaver (1980, 15-16) on the evolution of capitalism through competitive, finance and monopoly stages. According to Weaver, Latin American nations attempting to industrialize in the present era of monopoly capitalism face a situation which is qualitatively different from earlier periods, as a result of changes in i) the

technical and social conditions of industrial production, and ii) the industrial product mix underlying these conditions.

(6) Viewing technology as a commodity may cause some confusion. In many cases, it is not so much technology which is "commercialized," but rather the use of technology. Thus, it is perhaps better to speak of renting, rather than buying, technology, particularly in licensing agreements. I am grateful to Professor Michel Chussodovsky for drawing attention to this distinction.

(7) This is to some degree an exaggeration. Technology transfer does pose some real costs to TNCs (e.g., preparation of manuals, personnel training, further adaptive R&D, etc.) (See Teece, 1977). Nonetheless, Vaitos' point regarding the difficulty of arriving at a "fair" price is quite valid (See Chudnovsky, 1981, 140-143). For a more general introduction to the literature on the costs and benefits of TNCs (with regard not only to technology transfer, but also other issues), see Hood and Young, 1979, or the articles in Modelski, 1979.

(8) The primary advocate of the systems approach is (or was) Francisco Sagasti (see Sagasti, 1972); for a critique of this approach, see Amadeo, 1979, 150-152. In recent years, the systems approach has lost some of its former popularity, and in 1978 Sagasti himself was critical of early approaches based upon the concept of a science and technology "system" (Sagasti, 1978, 7). As late as 1977, however, Sagasti maintained a mechanistic attitude toward policy implementation, reducing the problem of implementing (or in his words, "activating") science and technology policies to a matter of "designing and operating the policy instruments that would orient technological behaviour ... in the direction specified by the objectives of technology policy" (Sagasti, 1977, 12).

(9) The same point holds true for integration policies in general. Vaitos (1978, 720) states the "policies on integration have, not infrequently, been assumed to be footloose and independent of the conditions imposed by the economic and political environment within which they are supposed to operate."

(10) Various authors have dealt with the role of the state in the Andean countries: on Bolivia, see Malloy (1977b); on Chile, see Lehmann (1978) or Ratcliff (1974); on Colombia, see Fernandez and Ucampo (1975) or Ruhl (1981); on Ecuador, see Hurtado (1980); on Peru, see Bamat (1983), Dore and Weeks (1977), Fitzgerald (1976), or Gorman (1982b); on Venezuela, see Perez Sainz and Zarembka (1979) or Petras, Morley and Smith (1977).

(11) At the subregional level, labour's influence also suffers from institutional limitations: Alcalde (1982, 36) notes that labour representatives on the Comité Asesor Económico y Social (CAES), or Economic and Social Advisory Committee, are

often named not by unions, but rather by the various national governments. Representatives on the new Labour Advisory Council (CCLA) are to be named directly by national labour organizations, but they still must be accredited by national governments (IL, agosto de 1983, 63).

(12) There have been some apparent exceptions, most notably under the Allende regime in Chile. According to Lehmann (1978, 107), however, the election of Allende was the result not of an assertion of popular power, but rather of a temporary rift within the Chilean ruling class, which afforded Allende a narrow margin of victory in a three-way race.

(13) To take just one example, Fontaine (1977, 52) notes that the Overseas Private Investment Corporation (OPIC), a branch of the U.S. State Department, took the "unprecedented step" of virtually ending the writing of insurance contracts within the Andean subregion after Decision 24 was approved.

(14) In January 1983, two new institutions were created: the Consejo Consultivo Empresarial Andino (CCEA), or Andean Business Advisory Council, and the Consejo Consultivo Laboral Andino (CCLA), or Andean Labour Advisory Council. The functions of these bodies are to make suggestions regarding more effective business and labour participation in the integration process, and to express opinions on the Junta's proposals for a re-orientation of the integration process. It is not clear to what extent these bodies will replace the CAES, or whether their powers are greater than those of the CAES (IL, agosto de 1983, 63-64).

(15) In a 1971 survey of nine Latin American countries' legislatures (including those of Chile, Colombia, Peru and Venezuela) it was found that of the Andean countries surveyed, only in Chile did the legislature play a substantial role; in Colombia and Venezuela it played only a moderate role in the political process, and in Peru only a minor role. See Agor (1971). Since 1971, of course, changes have occurred which would alter this ranking, particularly in Chile and Peru.

(16) As was mentioned in Chapter I, two semi-autonomous bodies -- the Corporacion Andino de Fomento and the Convenio Andres Bello -- are concerned at least tangentially with technology policy issues. These bodies are treated in some detail by Seidel (1974, 85-92).

(17) The influence of member governments is not necessarily equal. Just as national political systems are characterized by unequal representation of group/class interests, so there is a "structure" of unequal representation within subregional negotiations. While a number of factors are undoubtedly at work here, it can be expected that, ceteris paribus, the larger, more-developed member countries (Chile, Colombia, Peru, Venezuela) wield more power than the smaller,

less-developed members (Bolivia, Ecuador); this is due not only to the greater threat which the former's withdrawal from the group would pose to the integration system, but also to the greater financial and human resources upon which they can draw in negotiations. This point should not be exaggerated. Even the smaller countries can have a decisive impact on policies, especially in areas of particular concern to them -- witness, for example, the success of Bolivia and Ecuador in securing special treatment in most Group policies, and the failure of Peru and Venezuela in 1969 to obtain similar privileges.

(18) This point is supported by various studies of individual Andean countries. In a study of Colombian economic policy, Urrutia (1981, 186) argues that the Colombian business elite only manifested its opposition to certain government policies after these had been implemented. Similarly, Avery (1976, 567-568) sees the role of FEDECAMARAS, the principal Venezuelan business association, as a "reactive" one, limited to responding to the policy proposals of others.

CHAPTER III : HISTORICAL EVOLUTION OF THE COMMON TECHNOLOGY POLICY

A. INTRODUCTION

In the last chapter, it was argued that the primary purpose of the Andean Group's common technology policy, in its original form, was to increase the subregion's level of technological self-reliance. This was to be achieved largely through the adoption of measures designed to strengthen the position of the local bourgeoisie -- both improving their bargaining position vis-a-vis foreign technology suppliers, and fostering the development by local industrialists (often in conjunction with the state) of domestic technological capabilities (see Chapter II, Section B.1). Given these aims, it could be expected that the common technology policy would be supported by: i) the "progressive" sectors of industrial capital (in other words, by the existing or emergent "national bourgeoisie," which had entered into, or was about to enter into, competition with foreign capital); and ii) member governments which had adopted a "nationalist" development strategy, explicitly intervening in the economy to favour local over foreign capital. It could also be predicted that opposition to the common technology policy would come from: i) the forces of foreign capital, particularly technology suppliers in the AICs; ii) those sectors of the local bourgeoisie which were in alliance with or reliant upon foreign economic interests (e.g., the

agro-export oligarchy, financial interests, etc.); and iii) national governments whose development strategy was predicated upon unrestrained importation of technological inputs to the production process. These last points would be particularly true in a case like the Andean Group, where regulation of technology transfer is accompanied by regulation of direct foreign investment.

While there is considerable empirical support for these predictions -- see, for example, the work of Mytelka (1979, 93) on business attitudes toward Decision 24, or Tironi's analysis of the support of various Andean regimes for Decision 24 and other policy initiatives (Tironi, 1978c, 234) -- it is necessary to probe in more detail the forces and actors supporting and opposing the common technology policy. For example, Chudnovsky (1981, 134) argues that the support of the national bourgeoisie for measures to regulate technology transfer is in all likelihood not uniform, but varies in accordance with the ability of firms to pass on the costs of imported technology to their customers, and the importance of imported technology as a vehicle for competition with other domestic firms. (Chudnovsky's hypotheses, as well as other views on business attitudes toward regulatory policies, are examined in greater detail in Chapter IV). Similarly, it has frequently been suggested that foreign technology suppliers are not always opposed to regulatory measures; instead, they may be relatively indifferent, because of the price inelasticity of supply of imported technology mentioned

in the previous chapter, or even supportive, because of the greater stability provided by a clarification of the "rules of the game" regarding DFI and technology transfer (Krook, 1976, 97; Fernandez and Ucampo, 1975, 26). Finally, most hypotheses regarding support for technology policy activities deal only with measures regulating technology imports, largely ignoring other elements.

A more complete explanation must pay attention to a number of factors which can and do influence patterns of support for technology policy initiatives: for example, rifts within social groups/classes; inter-country differences, in terms of both the balance of internal social forces and the nature of national governments; and the distinctive character of various policy initiatives. Moreover, it is necessary to examine the way in which the political-economic determinants outlined in the last chapter interact with each other, their relative strengths, and, perhaps most importantly, variations in these determinants over time. In this chapter, the common technology policy is analyzed in an historical fashion, outlining the phases in the evolution of the policy, and the specific political-economic conditions which define each phase. For each of the three phases, the analysis moves from the general to the specific, looking first at changing contextual factors, and then proceeding to analyze indirect and direct actors in the policy process. In most cases, however, the various factors are mutually reinforcing, and a simple one-way causal link cannot be assumed.

B. EXPANSION : 1969 - 1974

The first phase in the evolution of the Andean Group policy was one of general expansion, at least in terms of formal technology policy. While the periodization of all the phases is necessarily imprecise, the first phase can be seen as running from late 1969, when negotiations on what was to become Decision 24 were initiated (Guerrero Cordero, 1979, 84), until July 1974, when Decision 89 was approved by the Andean Commission. It was during this first phase that Decision 84, which outlined the overall framework for the Group's technology policies, was adopted. In addition, major substantive policies were adopted in the areas of technology commercialization (Decision 24) and industrial property (Decision 85), and two technological development projects (PADTs) were set in motion in the copper and forestry industries (Decisions 86/87 and 89 respectively). Finally, industrial programming activities (as mentioned before, an element of implicit technology policy) began, albeit slowly, and negotiations were initiated with regard to a computerized information system to support other activities, and the development of methods of technological disaggregation. (For a chronology of important technology policy Decisions, see Appendix I.)

In terms of effective technology policy, gains were slower. Decision 84, it must be noted, did not itself initiate any concrete activities, but simply mapped out a strategy for a subregional technology policy. In addition, many of the policies

approved by the Commission encountered slow or imperfect implementation at the national level. In Colombia, implementation of Decision 24 was delayed until 1973 as a result of court proceedings brought by local and foreign business interests, which challenged the constitutionality of the law implementing Decision 24 (Mytelka, 1979, 65-66). Meanwhile, delays in setting up the necessary administrative machinery to implement Decision 24 impeded progress in Bolivia and Ecuador (Mytelka, 1979, 64-65; JUNAC, 1979b, 14-19). There were also some very real setbacks during this initial period: the adhesion of Venezuela in 1973, for example, necessitated the renegotiation of certain elements of Decision 24 (although not those related directly to the screening of technology contracts) and of certain industrial programming activities (Avery, 1976, 558-560).

Nonetheless, the overall record of the Group in terms of technology policy in this period is one of incremental but substantial progress. The reasons for this success lie in the three political-economic determinants outlined in the last chapter.

3.1 Contextual Factors

In the first place, the expansion of technology policy activities in this first phase was fostered by various contextual factors. Two broad types of contextual influences can be distinguished.

First, national, regional and international policy

initiatives provided a climate in which the common technology policy could grow. The foundation of the Andean Group itself gave momentum to the common technology policy; the initial period of political commitment to the Group helped advance the technology policy, especially as certain elements of this policy (i.e., Decision 24) were seen as essential to the overall success of the Group. In addition, the decision to follow an integration strategy based largely on industrial programming, rather than simple trade liberalization, increased the need for government action to secure the necessary technological inputs to the production process. At the national level, the prior adoption by some states (Colombia, Peru) of legislation regulating technology transfer and DFI helped clear the way for Andean Group policies in this area. The existence of prior national legislation not only sensitized decision-makers to the usefulness of such action, but also laid the administrative groundwork for the implementation of regional policies. Finally, there was probably a certain "demonstration effect" from other LDC policy initiatives: Vaitos (1973, 627-628) mentions the rise of OPEC as a stimulus to other nationalist, co-operative ventures among LDCs.

Second, global economic conditions played an important role, influencing the policy process in two principal ways. First, they helped to broaden the range of policies which could successfully be adopted at the national or subregional level. Vaitos (1973, 625-626), for example, argues that the increasing

strength of the West European and Japanese economies lessened the reliance of LDCs upon the U.S. for capital, technology and managerial skills; as a result, LDCs were able to adopt policies which maximized their choice with regard to suppliers of capital and technology. Similarly, the expansion of AIC economies in the 1960s and early 1970s (1) provided the countries of the subregion with a stable market for primary commodity exports (although volatile commodity prices caused considerable fluctuation in export income); this, combined with relatively low levels of external public debt, gave governments in the subregion the freedom to pursue ambitious economic policies, such as the common technology policy.

Second, the factors mentioned above, in conjunction with local economic trends (e.g., the increasing urbanization in many of the member countries, and the first tentative steps toward agrarian reform, both of which acted to expand the domestic market for manufactured goods), helped to foster the growth of a local industrial bourgeoisie. The expansion of this class, as will be pointed out below, was given added impetus by the adoption of import-substituting-industrialization (ISI) policies at the national and subregional levels. The impact of global economic trends varied from country to country, depending upon the resource base, structure of production and policy environment of each country, but had at least some impact throughout the subregion.

B.2. Indirect Actors -- Social Forces

As was mentioned earlier, various economic and policy-related factors combined in the 1960s and early 1970s to promote the growth of an industrial bourgeoisie in the Andean subregion. According to Vaitzos (1973, 630-633), the advent of such new "social sectors" at national economic and political decision-making centres was one of the principal reasons for the rise of measures to control DFI in Latin America during this period (see also Krook, 1976, 76-77). It can also be argued that the rise of the industrial bourgeoisie spurred the adoption of the Andean Group's common technology policy.

This point should not be exaggerated. There are indications that the industrial bourgeoisie was becoming a more potent economic and political force by the early 1970s. Table III.1, for example, illustrates the growing importance of secondary industry over the period 1960-1975, while Table III.5 indicates that in the 1960-1970 period, manufacturing output grew at a faster rate than gross domestic product (GDP) in all Andean countries. Value-added by secondary industry was still low in many countries (particularly Bolivia), however, and in some countries (e.g., Ecuador, Venezuela) growth of secondary industry during the 1960s was overshadowed by expansion of the tertiary sector.

Even where the industrial sector as a whole was growing, there are indications that local and foreign capital, rather than being competitive (a prerequisite for the existence of a dynamic national bourgeoisie), had "carved out" distinct areas of

TABLE III . 1
Andean Group Countries : Distribution of Gross Domestic Product by Sector *,
1960 -1982 (Percent)

	1960	1970	1975	1980	1982
Bolivia -- Primary	32.6	28.4	26.9	23.9	28.1
Secondary	17.3	20.0	20.8	21.6	18.7
Tertiary	50.1	51.6	52.3	54.5	53.2
Chile -- Primary	18.3	15.1	18.2	15.4	18.2
Secondary	31.4	33.9	29.4	29.2	26.5
Tertiary	50.3	51.1	52.4	55.4	55.2
Colombia -- Primary	33.3	28.3	26.4	24.7	24.2
Secondary	22.6	25.0	25.0	24.0	23.2
Tertiary	44.1	46.7	48.6	51.3	52.6
Ecuador -- Primary	30.1	22.5	30.5	25.5	25.9
Secondary	20.4	25.6	24.3	25.3	26.0
Tertiary	49.5	51.9	45.2	49.2	48.1
Peru -- Primary	27.2	25.1	18.6	22.3	23.1
Secondary	28.0	29.4	30.7	30.9	30.1
Tertiary	44.8	45.5	50.7	46.8	46.8
Venezuela -- Primary	33.6	26.2	16.8	14.3	13.3
Secondary	20.5	21.9	24.4	26.7	26.5
Tertiary	45.9	51.9	58.8	59.0	60.2

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* Primary Sector = Agriculture; Mining
Secondary Sector = Manufacturing; Construction; Electricity, Gas and Water
Tertiary Sector = Wholesale and Retail Trade; Transportation and Communications;
Financial Services; Other Services; Government Sector

Source : 1960,1970,1980,1982 -- adapted from IDB, 1983
1975 -- adapted from IDB, 1983

activity (2). As a result of the region's historical position as a supplier of raw materials (especially minerals) to the AICs, the majority of DFI is concentrated in resource extraction; DFI in the manufacturing sector only began in earnest in the 1950s, and is still relatively low, although there were signs of rapid increase in the less-developed member countries (Bolivia and Ecuador) in the 1970s (see Table III.2). Within the manufacturing sector, moreover, DFI is highly concentrated in certain industries, most notably chemical products (see Table III.3). Data on the share of TNCs in the manufacturing sectors of Chile, Colombia and Peru, presented in Table III.4, also indicate that foreign capital is concentrated in certain industries and product lines, with other activities left largely to domestic industry. Not surprisingly, foreign ownership is highest in the more technologically sophisticated industries (chemicals, metalworking).

The existence in this first phase of an expanding national bourgeoisie, which had entered into competition with foreign capital and was able to influence national and subregional policy, is thus open to some doubt. In Bolivia and Ecuador, it is doubtful whether a true "national bourgeoisie" of any appreciable size or strength existed in 1970. Hurtado (1980, 175-180) argues that the Ecuadorian bourgeoisie is characterized by a substantial unity of interests, in which the "non-modernizing" elements, (i.e., the traditional oligarchy) appear to be dominant. Malloy (1977b, 476) notes that the

TABLE III . 2

Andean Group Countries (Excluding Chile) :
Distribution of DFI by Sectors, 1971 and 1977 (Percent)

Sector	Bolivia		Colombia		Ecuador		Peru		Venezuela		Andean Group	
	1971	1977	1971	1977	1971	1977	1971	1977	1971	1977	1971	1977
Agriculture, fisheries, etc.	n.a.	0.1	0.4	0.5	n.a.	0.6	1.3	0.6	0.8	0.8	0.8	0.7
Mining and hydrocarbons	n.a.	45.8	44.3	42.8	n.a.	83.2	52.3	69.9	58.6	61.0	50.8	62.2
Manufacturing	6.7	25.0	37.0	38.6	3.3	11.0	35.2	17.5	16.4	23.4	22.3	23.2
Commerce and finance	n.a.	25.0	13.5	13.9	n.a.	4.4	8.9	5.0	10.4	11.4	9.9	9.7
Others	n.a.	4.1	4.7	4.2	n.a.	0.9	2.3	7.0	13.8	3.4	9.2	4.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

n.a. = information not available

Source : JUNAC, 1979b, Tables II-14, II-16 to II-19.

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TABLE III.3

Andean Group Countries (Excluding Chile) :
Distribution of DFI in Industrial Manufacturing Sector,
by Product Lines, 1971 (Percent)

Product Line	Bolivia ¹	Colombia	Ecuador ¹	Peru	Venezuela	Andean Group
Food, beverages and tobacco	27.6	8.5	31.6	18.8	24.0	18.2
Textiles and leather	28.0	6.0	4.2	11.3	5.7	7.4
Wood and furniture	5.3	1.2	2.7	0.6	0.5	0.8
Paper and printing	n.a.	11.6	2.5	15.9	5.4	10.0 ²
Chemical products	12.3	47.1	30.2	15.6	29.5	30.8
Non-ferrous minerals	n.a.	6.9	5.9	4.0	6.5	5.9 ²
Basic metals	----- ³	2.1	3.9	21.7	2.0	7.3
Machinery and equip.	13.0	15.5	18.8	10.7	25.0	18.3
Others	13.8	1.1	0.2	1.4	1.4	1.3
Total	100.0	100.0	100.0	100.0	100.0	100.0

n.a. = information not available

¹annual average, 1971-77

²not including Bolivia

³for Bolivia, this category is included in Machinery and Equip.

Source : JUNAC, 1979b, Tables II-21 to II-26.

TABLE III . 4

Share of Transnational Corporations in the
Manufacturing Sector of Chile, Colombia, Peru
(Percentage)

ISIC Code	Sector	Chile ^a		Colombia ^b	Peru ^c	
		1967	1978	1974	1971	1974
31	<u>Food industry</u>	19.7	18.5	16.4	--	--
311-2	Food products	--	16.4	22.0	26.1	24.4
313	Beverages	--	1.6	3.1	30.1	24.5
314	Tobacco	--	100.0	1.1	91.3	79.6
32	<u>Textile industry</u>	8.4	11.2	50.2	--	--
321	Textiles	--	4.1	61.9	28.1	25.6
322	Wearing apparel-	--	--	9.3	6.0	--
323	Leather goods	--	51.2	18.4	6.8	8.9
324	Footwear	--	--	22.7	29.0	28.5
33	<u>Wood* industry</u>	1.6	0.0	23.2	--	--
331	Wood and products	--	--	33.5	5.4	2.4
332	Furniture, non-metal	--	--	6.0	12.8	14.5
34	<u>Paper industry</u>	12.8	16.6	55.8	--	--
341	Paper and products	--	21.1	79.3	74.9	13.2
342	Printing and publishing	--	12.5	6.0	2.4	--
35	<u>Chemical industry</u>	41.4	56.6	62.4	--	--
351	Ind. chem. substances	--	54.0	79.5	54.8	47.8
352	Other chem. products	--	53.2	60.2	58.5	60.9
353	Petrol. refineries	--	--	22.0	6.1	5.4
354	Petrol/Coal deriv.	--	69.3	9.2	80.3	--
355	Rubber products	--	72.8	82.0	84.0	78.0
356	Plastic products	--	35.5	47.2	26.8	36.0
36	<u>Non-met. mineral products</u>	39.7	39.6	58.4	--	--
361	Clay/porcelain products	--	12.5	16.6	--	--
362	Glass and products	--	--	84.0	9.3	10.5
369	Other products	--	61.2	56.6	36.4	3.2
37	<u>Basic metal products</u>	30.6	15.4	54.7	--	--
371	Iron and steel	--	--	49.8	20.4	16.6
372	Non-ferrous metals	--	46.7	73.5	94.3	5.9

TABLE III . 4 (Continued)

ISIC Code	Sector	Chile ^a		Colombia ^b	Peru ^c	
		1967	1978	1974	1971	1974
38	<u>Metalworking industry</u>	27.9	47.8	58.2	--	--
381	Metal products	--	28.6	42.7	18.9	14.0
382	Non-elec. machinery	--	7.1	29.6	15.1	16.4
383	Electric machinery	--	55.7	67.2	53.8	55.1
384	Transport equip.	--	79.4	79.7	40.6	46.1
385	Scientific equip.	--	24.0	38.6	46.2	45.1
39	<u>Other manufacturing industry</u>	--	18.3	23.4	14.5	8.4
	TOTAL	18.6	25.2	43.4	34.0	25.2

a = share of sales accounted for by firms with at least 10 per cent foreign participation

b = share of production accounted for by firms with foreign participation

c = share of manufacturing production accounted for by transnational corporations

-- = information not available

Source : UNCTC, 1983, p. 351 (compiled from various original sources)

TABLE III . 5

Andean Group Countries : Average Annual Rates of Growth of
Gross Domestic Product and Value-Added in Manufacturing (Percent),
in Real Terms

Country	Growth of Gross Domestic Product (Annual Averages)			Growth of Value-Added in Manufacturing (Annual Averages)		
	1960-70	1970-80	1980-82	1960-70	1970-80	1980-82
Bolivia	5.0	4.5	-5.0	6.4	5.5	-9.7
Chile	4.2	2.5	-4.6	5.3	1.1	-10.5
Colombia	5.2	5.8	2.0	5.9	5.9	-1.1
Ecuador	4.9	8.9	3.1	9.1	9.6	5.0
Peru	5.0	3.0	2.3	5.9	3.0	-0.3
Venezuela	6.1	4.1	0.5	7.5	5.1	0.2

Source : Calculated from IDB, 1983 (original figures expressed in 1980 U.S.dollars).

relative failure of import substitution in Bolivia has meant that there has never been an entrepreneurial national bourgeoisie which could effectively influence state policy. Moreover, Vaitos (1978, 724) argues that Bolivian and Ecuadorian industrialists were willing to enter into alliances with foreign capital (based on either DFI or technology transfer) since their main concern was not competition with TNCs, but rather "catching up with their counterparts in Colombia and Chile."

Even in the relatively more industrialized member countries, a national industrial bourgeoisie was by no means unquestionably dominant in 1970. In Venezuela, "progressive" sectors of the local capitalist class had begun to assert their independence from the principal business organization, FEDECAMARAS, which is dominated by a traditional financial oligarchy, in alliance with foreign capital (Petras, Morley and Smith, 1977, 34); however, Avery (1976, 567) notes that non-industrial interests were still able to prevail, and their opposition to certain elements of the Cartagena Agreement stalled Venezuelan entry into the Andean Group until 1973 (3). Mytelka (1979, 24-25) argues that in Chile, the development of an industrial class in competition with foreign capital has been impeded by the relative absence of TNCs from the manufacturing sector, and by close ties between local and foreign financial and commercial interests. Even in Colombia, which according to Mytelka (1979, 27) has the most fully developed national bourgeoisie in the subregion, financial and import-export

interests hold considerable power: while some smaller, less influential groups backed Decision 24 (e.g., the Colombian Popular Association of Manufacturers, ACOPI), the major business group, ANDI (the National Association of Industrialists) and the National Banking Association were opposed (Sherman, 1973, 119).

B.3. Direct Actors

Despite these qualifications, there can be little doubt that the industrial bourgeoisie in the Andean countries was expanding in the late 1960s and early 1970s. The growth of this class gave impetus to (and in turn received impetus from) the rise during the late 1960s and early 1970s of "nationalist" regimes in the Andean Group countries -- the Ovando Candia and Torres governments in Bolivia; the Frei and Allende regimes in Chile; the military regimes of Rodriguez Lara in Ecuador and Velasco in Peru; the Perez administration in Venezuela (at a slightly later date); and to a somewhat lesser extent, the Lleras government in Colombia. These regimes were by no means totally homogeneous in terms of ideological orientation or economic policy, but all shared a commitment to a form of "developmental nationalism," which found expression in the integration strategy of the Andean Group. Various authors have linked the rise of the Andean Group to the birth of "nationalist" political regimes in the subregion (Mace, 1981; Petras and Morley, 1978; Puyana de Palacios, 1982, 59; Tironi, 1978c, 252-253), although few link policy changes to changes in underlying social forces and

contextual factors. At a more specific level, it can also be argued that the acceptance of a nationalist development strategy by the countries of the subregion made possible the expansion of the Group's technology policy activities. Three elements of this strategy are important in this regard.

First, the regimes shared a new, more cautious attitude toward foreign economic interests. As Tironi (1978c, 249-252) argues, financing of development was to be based mainly on internal savings, with a subsidiary role for foreign capital, subject to state control; similarly, technological inputs to the production process would, wherever possible, be of domestic origin, and state regulations would govern technology transfer. This new attitude was reflected in the nationalization of various foreign-owned companies (the International Petroleum Company in Peru, the Chilean copper industry, Venezuela's petroleum industry), in the drafting of national regulations on DFI and technology transfer (e.g., the Colombian Committee on Royalties, established in 1967), and in the adoption of certain technology policy decisions, most notably Decision 24, at the subregional level.

Second, the various national regimes supported an increased economic role for the state, via both state regulation and direction of private economic activity, and the growth of public enterprise. All the regimes can be seen as favouring "mixed economies" (Tironi, 1978c, 249), albeit with significant variations in the shares of public and private enterprise. As

was pointed out in the last chapter, the approach to technology policy upon which Andean Group efforts are based demands an active economic role for the state; the acceptance of this postulate at the national level is all the more important because of the fact that implementation of technology policies is often left in national hands.

Finally, as Tironi (1978c, 249-252) states, in the majority of the Andean countries national development strategy was predicated upon the growth of industry, and within industry upon the development of the capital and intermediate goods industries; industrialization was to be achieved by import substitution (ISI) on a regional basis, and by an expansion of the effective internal market through agrarian reform and other policies of income redistribution. (At best, however, redistributive policies suffered incomplete implementation in all the Andean countries.) By the late 1960s, the more-developed Andean countries (Colombia, Chile, and to a lesser degree Peru and Venezuela) had begun to reach the limits of the so-called "easy" phase of import substitution (i.e., domestic production of consumer durables); limited internal markets prohibited the transition to the next phase (production of intermediate and capital goods) on a national basis. As a result, governments supported ISI on a subregional basis, through the Andean integration process.

This had an important impact on support for technology policies. According to Vaitzos (1983, 83-84), ISI in the Andean

Group is based on a process of "production deepening," in which industry gradually expands into technologically more complex areas of production, through the exploitation of backward linkages. Typically, then, each successive stage in the ISI process generates increased demand for technology, whether local or foreign. In itself, this does not provide a rationale for the adoption of explicit technology policies, but combined with the other elements of "developmental nationalism" outlined above, it does. In the absence of explicit technology policies, technological requirements would in all likelihood be filled from existing foreign sources. This, however, is unacceptable to governments which have adopted a restrictive attitude toward foreign economic interests, and favour the use of state power in support of local business. Thus, regional ISI, in conjunction with the other elements of the overall economic strategy, creates a demand for policies both to regulate technology transfer and to stimulate domestic innovation.

Obviously, support for these postulates was not uniform among member countries. In the smaller, less-developed member countries (Bolivia and Ecuador) the fact that import substitution had reached only rudimentary levels by 1970, and the resultant weakness of industrial interests, reduced support for the "nationalist" philosophy in general, and the common technology policy more specifically. This is reflected in the relatively lax application of Decision 24 in these countries (JUNAC, 1979c, 46), and, in the case of Bolivia, in post-1971 policy shifts,

when the Banzer government began to follow an economic strategy based upon limited state intervention and a receptive attitude toward DFI (Mace, 1981, 119-126). As well, Ruhl (1981, 52-54) argues that by the late 1960s under Lleras, Colombia had begun to move away from a strict ISI strategy, toward export promotion and diversification; the shift accelerated under the Pastrana and Lopez Michelson governments (see also Berry and Thouni, 1977). Thorp (1977, 125) notes a similar shift in Peru under the Velasco regime, usually considered one of the more nationalistic Andean regimes. In neither case, however, were ISI policies totally abandoned; more importantly, in neither Peru nor Colombia was there the type of wholesale rejection of the developmental nationalism strategy which occurred in Chile after the 1973 coup.

One final point should be made. Given the relative weakness of industrial interests described in the last section, the nationalist position of the various member countries, and the support of political regimes for initiatives such as the common technology policy, cannot be seen as a straightforward government response to pressures from an existing national bourgeoisie. Rather, political regimes in the subregion acted to foster an emerging bourgeoisie, which in many cases had not yet become a viable political or economic force. While this is particularly true of Bolivia and Ecuador, it also holds true, in varying degrees, for the other member countries. Thus, as Petras and Morley (1978, 165) argue, the "nationalist project" of the Andean states -- upon which the common technology policy was based --

was a "conjunctural" event, resting on a relatively weak social basis; such policies were supported by the incipient national bourgeoisie, but the weakness of this group could not provide a stable basis for the adoption and implementation of these policies. This had two effects. First, "nationalist" regimes and policies had little guarantee of permanence, but rather could be altered as a result of changing economic conditions, or a reassertion of power by the more traditional oligarchy. Second, policies adopted by the Andean Group were often imperfectly implemented at the national level, because of the lack of a strong constituency supporting them.

C. STAGNATION, 1974 TO 1980

The second phase in the evolution of the Andean Group's technology policy, dating from 1974 until 1980, was one of stagnation. Not only did concrete achievements lag behind those of the initial phase, but the policy also failed to adhere to its original timetable: by 1979, the technological information system (SAIT) had not yet been approved, Decision 85 was not yet in force in all Andean countries, and some activities (e.g., technological disaggregation) seemed stalled at the stage of pilot projects.

To a large degree, the stagnation of the Group's technology policy parallels a more generalized "crisis" in the Andean Group, which reached its climax with Chile's withdrawal from the Group in 1976, and effectively paralyzed the integration

process in the mid-1970s (Salgado, 1981, 67). The outlines of the crisis are well-known (see Briones, 1976, 259-262; Guerrero Cordero, 1979, 219-302; Mytelka, 1979, 68-75; Puyana de Palacios, 1982, 194-196). It arose in 1974, when the new Chilean regime passed a statute on foreign investment (Decree-Law 600) which openly contradicted Decision 24 -- although, as Guerrero Cordero (1979, 219) points out, the crisis actually reflected a more widespread disagreement over an entire range of policy issues. From the point of view of the present study, the most obvious effect of the crisis was the 1976 approval of Decision 103, which substantially liberalized many of the provisions of Decision 24. The changes introduced, however, mainly concerned regulation of DFI, not technology transfer. Some of the provisions did deal with technology-related issues -- for example, "invisible technological contributions" could now be counted as DFI when calculating allowable profit remittances -- but no major changes were made to regulations governing review of technology contracts (Puyana de Palacios, 1982, 195-196). Thus, the stagnation of technology policy in this second phase did not result from changes to the technology-related elements of Decision 24, or from revisions to other explicit policies. Existing formal technology policies remained largely intact during this period, and stagnation was expressed in three other ways.

First, few new explicit policy measures were approved. There were, of course, some exceptions. In 1978, Decision 126 approved a new PADT dealing with food production and distribution

technologies. Some progress was also made in the fields of technological disaggregation and international technology search, although on a relatively limited scale; work in connection with the petrochemical PSDI (Decision 91) led to the development of a "Basic Disaggregation Model," and the publication of a "Disaggregation Manual" and "Catalogue of Manufacturers" (JUNAC, 1979c, 16-21). While work continued within the Junta on the design of an information system to support other activities (JUNAC, 1979c, 42-45), and upon two new PADTs (JUNAC, 1979c, 33-42), by the beginning of 1980 these still had not been approved by the Commission.

Second, implementation of policies approved by the Commission was slow, and in many cases imperfect. Problems in the implementation of Decision 24 had surfaced long before 1974, but in the 1974 to 1980 period implementation of other policies also became problematic. As of March 1976, none of the Andean countries had incorporated Decision 85 into their national legislation, and only Peru had expressly incorporated Decision 84 (Derecho de Integración, 1976, 115). By 1979, Decision 85 had still only been incorporated by Colombia and Ecuador (JUNAC, 1979c, 15). These statistics, moreover, do not deal with divergent applications of Andean Group policies. While by the mid-1970s Decision 24 had been implemented in a formal sense by all member countries, the manner of implementation varied from country to country, ranging from a relatively strict application of the statute's provisions in Colombia, to an almost complete

absence of concrete regulations in Bolivia (JUNAC, 1979b, 14-18).

Finally, the general "crisis" in the Andean Group during the mid-1970s had negative effects on the approval and implementation of elements of implicit technology policy. The most obvious example of this was the revision of Decision 24 in 1976, which constituted a major "opening up" of the subregion to DFI and (indirectly) technology transfer. Also important was the relative stagnation of industrial programming activities in the latter half of the 1970s: while the petrochemical and automobile programs were approved in 1975 and 1976 respectively, no further PSDIs were approved until 1980, when the iron and steel program was established (Puyana de Palacios, 1982, 261). Even within the programs approved, implementation was imperfect (Guerrero Cordero, 1979, 373), and technological considerations were often largely ignored (Mytelka, 1979, 147-148).

As in the previous phase, the evolution of the Group's technology policies in the 1974 to 1980 phase is best explained by referring to the three types of political-economic influences outlined in Chapter I.

C.1. Contextual Factors

This second phase was characterized by several changes in contextual factors. First, just as the general expansion in the Andean Group helped propel technology policy activities forward in the 1969-1974 period, so the crisis of the mid-1970s had negative effects on progress in this area. While the influence

of the crisis on implicit technology policies (e.g., the PSDIs) has already been mentioned, it also affected explicit policies. A good example is the proposed technological information system (SAIT). While work began on the design of such a system in 1973, and was almost completed by 1975, the conflict over Decision 24 (and, to a lesser degree, the failure of member countries to incorporate Decision 85 into national legislation) delayed its introduction before the Commission until 1979 (JUNAC, 1979c, 43). The failure to approve the SAIT was in turn a prime factor limiting the effective implementation of Decisions 24 and 85 at the national level (JUNAC, 1979c, 14).

In addition, by the mid-1970s the favourable economic conditions which helped spur the initial common technology policy had given way to a period of worldwide recession, resulting from the contraction of AIC demand and rising inflation rates following the first oil price shock. These factors, combined with contradictions arising from the operation of "nationalist" policies in the subregion (e.g., increased government spending, over-valued exchange rates), and the widespread availability of foreign creditors, led to an increase in the external public debt of the Andean countries during the 1970s (see Table III.6). The extent of the increase, of course, varied considerably, depending on the situation of individual countries: Venezuela and to a lesser degree Ecuador were cushioned by their position as petroleum exporters, and Colombia's relatively strong export position provided some protection; in Bolivia, Chile and Peru, on

TABLE III . 6

Andean Group Countries : External Public Debt and Debt Service
as Percentage of GNP and of Exports of Goods and Services, 1960 - 1981

Country	Debt as % of GNP				Debt Service as % of Exports			
	Annual Averages				Annual Averages			
	1961-70	1971-75	1976-80	1981	1961-70	1971-75	1976-80	1981
Bolivia	43.5	57.5	89.4	82.2	10.3	14.1	29.0	25.5
Chile	28.3	44.4	39.6	25.0	17.0	16.5	29.6	27.4
Colombia	22.7	26.0	25.1	28.5	13.5	13.6	11.0	17.3
Ecuador	17.0	18.7	37.1	46.4	8.1	7.1	15.5	18.4
Peru	13.2	22.9	41.3	36.3	9.5	22.9	28.6	47.2
Venezuela	6.9	10.3	22.7	28.4	2.7	5.2	10.1	14.7
Latin America	13.3	17.6	29.0	31.2	13.5	13.5	23.7	14.2

Source : IDB, 1983, p. 139.

the other hand, debt and debt-service ratios climbed, at least partly because of declines in mineral (e.g., copper) prices in the mid-1970s.

Increasing debt affected progress in technology policy in three ways. First, in a general sense, it accelerated the shift away from "nationalist" development strategies, toward policies which emphasized export-oriented growth and limited government expenditure; this effect was perhaps most pronounced in Peru, where debt problems forced policy changes along the lines of an IMF stabilization program (Petras and Morley, 1978, 162-163; Gorman, 1982b, 25-26). Second, the influx of foreign credit in the 1970s reduced demand for locally-generated technology, by making imported technological inputs more affordable (JUNAC, 1983c, 11-14). Finally, debt problems led to shortfalls in member countries' contributions to the Group's budget; Mytelka (1979, 188) notes that decreases in the Junta's budget and in the size of its technology policy division had a negative impact on progress in the design and application of technology policies within the Group.

C.2. Indirect Actors -- Social Forces

In terms of internal social forces, two broad changes are important to an understanding of the second phase of the common technology policy. First, in some countries, there was a reduction of conflicts within the local capitalist class. In Chile, for example, the election of Allende had been, according

to Lehmann (1978, 107), the result of a rift within the Chilean ruling class: in the 1970 election, the more conservative landholding elements had withdrawn their support from Frei's mildly reformist policies in favour of Alessandri, and the resultant split in business support afforded Allende a narrow margin of victory in a three-way race. By 1973, however, this rift had healed, and business attitudes coalesced in relatively united opposition to Allende's policies, and to nationalist initiatives like Decision 24 (Mytelka, 1979, 35-36) (4). In Peru, the situation was slightly different. The Velasco regime had originally received considerable support from industrial interests, largely because of the regime's anti-oligarchial policies (e.g., the agrarian reform, which expropriated the oligarchy's coastal agro-export estates, and generally secured a net transfer of resources from agriculture to industry and the service sector). By 1976, however, new policies aiming at reform of the industrial sector (e.g., the industrial community legislation, which envisioned greater labour participation in management decisions), and the trend toward increased state participation in the economy, had alienated industrial interests. This, combined with the regime's failure to build a viable popular basis of support, contributed to the gradual shift in policy under Morales Bermudez.

Second, there is some indication of a stagnation of the growth of secondary industry, at least in the cases of Chile, Colombia and Peru. Table III.5 shows that between 1970 and 1980

the rate of growth of manufacturing output, which during the 1960s had outpaced growth of GDP, was roughly equal to the rate of growth of GDP in Colombia and Peru, and significantly lower than the growth rate of GDP in Chile. While the impact of this change should not be exaggerated, it does seem to indicate a gradual weakening of the relative influence of industrial interests (who, it must be remembered, should be the most stalwart supporters of the common technology policy).

There are several possible explanations for this trend. Malave Mata (1982, 101-102), writing on Venezuela, argues that the 1970s witnessed a gradual transfer of local investment capital out of productive activities in the primary and secondary sectors, into more lucrative speculative investments in the tertiary sector. While Table III.1 shows at least some support for this hypothesis for Venezuela (5), the evidence for Chile, Colombia and Peru is less clear-cut. Instead, a combination of factors appear to be at work. First, by the early 1970s, the limits of the first phase of import substitution had probably been reached in Chile and Colombia, leading to both a transfer of resources out of the industrial sector, and a lower productivity of new investments in the sector. Second, decreased AIC demand and increased inflation rates in the mid-1970s, probably had a negative impact on manufacturing output, particularly in the oil-importing member countries. Finally, the industrial sector was adversely affected by government policies adopted during the 1970s; this is particularly true in Chile, where the policies of

the Pinochet regime (e.g., widespread reduction of tariffs) drastically weakened local industry (Remmer, 1979, 454-455). Thus, the stagnation of the industrial sector both helped promote the shift to more "open" economic strategies, and received added impetus from this shift.

The position of foreign capital in this second phase exhibits two seemingly contradictory tendencies. On the one hand, there was considerable foreign opposition to elements of the common technology policy, and other Andean Group policies. Foreign (particularly U.S.) opposition to Decision 24 was, of course, evident long before 1974, and in large part centred on the juridical battle over Decision 24 in Colombia (Wionczek, 1971, 29-29; Sherman, 1973, 111-113). To a large degree, such opposition continued during the mid-1970s, and in some cases spread to other elements of the common technology policy. Vaitsos (1983, 109-110), for example, notes the hostile foreign position with regard to Decision 85 (see also JUNAC, 1983c, 7-8).

On the other hand, there was some evidence of a softening of foreign opposition during the 1970s, even before the 1976 revision of Decision 24 (Fontaine, 1977, 53). As early as 1972, it was reported that foreign opposition to Decision 24 was "evaporating," with Japanese and West European companies (but not U.S. firms) willing to invest in the Andean subregion under the new rules (LA, Sept. 29, 1972, 307). In all likelihood, however, this was due not so much to a re-thinking of opposition to the statute, but rather to a realization of the "loopholes" provided

by the imprecise wording of Decision 24, and its divergent application at the national level. Even the Council of the Americas, the most stalwart opponent of Decision 24, had by the mid-1970s begun to realize that the statute was perhaps not as stringent as originally thought (Council of the Americas, 1973, III-39).

C.3. Direct Actors

This combination of changing contextual factors and social forces was largely responsible for changes in the economic strategy of some of the member governments during the mid-1970s. Puyana de Palacios (1982, 59) argues that "by 1974 Colombia and Chile had started a process of liberalization of their economies that soon came into conflict with the economic model followed by the remaining member countries, and with the scheme of integrated development [pursued by the Andean Group]." While the shift was less drastic in Colombia (6), in Chile there were revisions to all of the central elements of the "nationalist" development strategy outlined above: a new "open" attitude toward foreign investment and technology transfer; a reduced economic role for the state; and a shift in industrial policy from ISI to export promotion and diversification measures. Similar changes also occurred in other member countries, although to a lesser extent, and at a more gradual pace. The changes brought about by the 1971 Bolivian coup have already been mentioned. In Peru, the latter half of the 1970s saw a gradual revision of the

nationalist policies of the 1968-1975 period; the replacement of Velasco by Morales Bermudez, while not as radical a change as that occurring in Bolivia or Chile, led to a decrease in the economic role of the state and a greater openness to foreign economic interests (Gorman, 1982b, 25-26; Mace, 1981, 138-146).

Since changes in contextual factors and social forces were not uniform in all member countries, however, the regime changes were not sufficiently broad to produce the type of consensus with regard to development strategy which had existed during the late 1960s and early 1970s. In Ecuador and Venezuela, for example, the changes outlined above were mitigated by expanding oil revenues, and the relatively late start of ISI policies in both these countries; as a result, both countries largely maintained their ISI policies during the mid- to late 1970s (Puyana de Palacios, 1982, 62-64). In Venezuela, in fact, the mid-1970s were a period of relative economic nationalism, the high-water mark of which was the nationalization of the petroleum industry by the Perez administration.

This lack of consensus helps to explain why, in the 1974-80 period, changes in the Andean Group technology policy consisted largely of a failure to approve new initiatives, and the de facto revision of existing ones as a result of divergent application at the national level. In a sense, the regime changes were only able to paralyze the common technology policy, without formally altering its direction. Petras and Morley

(1978, 166) make this point with regard to the DFI provisions of Decision 24:

With the exception of Chile, the Andean Common Market controls and restrictions on foreign capital operations were not directly challenged and forcibly dismantled over a short term period. Instead, as various political regimes began to move away from their original nationalist aims they looked to the tactic of incremental dissolution of the central investment controls that defined Decision 24 and other constraints on capital accumulation "from the outside." The utilization of these loopholes and qualifications had the practical effect of rendering the foreign investment code increasingly obsolete in the new context.

The same could probably be said for many other elements of the common technology policy (e.g., Decision 85).

D. REBIRTH, 1980 TO PRESENT

Beginning in 1980, the Andean Group's technology policy entered what appears to be a phase of rebirth. The first indication of a revitalization of technology policy activities was the approval in June 1980 of Decision 154, which set up the long-awaited SAIT (Flores, 1981). In 1981, Decision 167 set up a new PADT, concerned with technologies for the rural sector.

The most important evidence of "rebirth," however, came in 1982, when the Junta presented its proposals for the creation of a Programa Andino de Integración Científica y Tecnológica, or Andean Program of Scientific and Technological Integration. The Programa is intended as a long-term strategy for science and technology policies in the subregion (JUNAC, 1983b, 3). The

Junta has also proposed a new science and technology policy infrastructure for the subregion, called the Sistema Andino de Ciencia y Tecnología (Andean System of Science and Technology), and comprising the following institutions (JUNAC, 1983b, 5-6):

i) the Consejo Andino de Ciencia y Tecnología (Andean Council on Science and Technology), composed of national representatives of bodies concerned with development planning, scientific and technological activities, and higher education, as well as technology users (i.e., representatives of public and private sector productive enterprises). The Consejo would act as an advisory body to the Commission and the Junta on science and technology issues.

ii) the Fondo Andino de Desarrollo Científico y Tecnológico, or Andean Fund for Scientific and Technological Development. This body's purpose would be to secure the financial resources necessary to sustain the Group's technology policies.

iii) specialized Grupos de Trabajo (Working Groups), of two basic types: a) co-ordinating bodies, whose task is to co-ordinate the activities of the Group's science and technology bodies with the productive sector, local scientific institutions, and professional associations; and b) expert bodies, set up to study specific issues, at the recommendation of the Consejo or the Junta.

iv) a Secretaría Permanente (Permanent Secretariat), organized within the Junta, designed to provide technical assistance and co-ordinating activities for the rest of the Sistema.

While this new institutional structure has not yet been fully instituted, some progress is being made: a recent article notes that the Andean Commission has approved the creation of both the Consejo and the Fondo (IL, mayo de 1983, 63).

On the other hand, it has yet to be seen whether the Group will be able to move beyond the stage of institution building, toward the adoption and implementation of new policies. Work has

been undertaken, nonetheless, on the design of such policies. While the Programa is not explicitly intended as a replacement for Decision 84, it does outline a new "model" for the Group's technology policies which is substantially different from that outlined in Decision 84 (JUNAC, 1983c, 11-25). Although the precise nature of this "model" has not been finalized, several points stand out as particularly significant.

First, there is some evidence of a change in the objectives of the Group's technology policy. A 1983 Junta document (JUNAC, 1983b, 3) lists the following as objectives of the new technology strategy:

- i) increases in the quantity and quality of goods and services produced in the subregion;
- ii) generation of employment and improvement of the conditions of work;
- iii) increased international competitiveness for the Andean productive structures;
- iv) reduction of existing social and sectoral imbalances (7); and
- v) reduction of external dependence.

While the need to reduce technological dependence is mentioned, it appears to be increasingly subordinated to other, more finite objectives. In addition, the new strategy has more limited objectives in terms of areas of action. Decision 84 did not set out any sectoral priorities, although the Junta did stress that the policy should concentrate upon "areas of social interest" and traditional and non-traditional exports (JUNAC, 1976a, 16). The

new strategy, on the other hand, recommends concentration of efforts in several priority sectors (JUNAC, 1983c, 25):

- i) manufacturing sector -- capital goods, priority sectors for industrial rationalization;
- ii) agro-industry -- food and nutrition, forest resources;
- iii) energy -- non-conventional sources; and
- iv) extractive industry -- mineral-metallurgical sector.

These areas have been selected not only because of a recognition of the finite nature of available financial and human resources, but also to reinforce newly defined priority areas for the integration process as a whole (JUNAC, 1983c, 23-25).

Second, there appears to be a decreased emphasis on those elements of the common technology policy which deal with the control of technology imports, and an increased emphasis on policies related to local generation of technology. The new strategy does pay some attention to control of technology transfer, but most of its action with regard to technology transfer is geared to policies to improve the assimilation of imported technology: continued work on methods of technological disaggregation; the completion of inventories of technological capacities; and actions to improve negotiating abilities, through international technology searches (JUNAC, 1983c, 18-19). While the Junta argues that this is because the process of control via Decision 24 is now largely complete (JUNAC, 1983b, 7), it also appears to result from a conscious decision to de-emphasize the

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regulatory aspects of the common technology policy (Decision 24, Decision 85), and emphasize the programming aspects (e.g., the PADTs). The change also perhaps reflects a recent shift in the theoretical literature on technology policy, which has begun to stress the importance of developing indigenous technological capabilities, as opposed to the former emphasis on regulation of technology transfer (see, for example, Mytelka, 1983; Dahlman and Westphal, 1981; Katz *et al.*, 1978) (8).

Finally, the new strategy appears to favour the development of policy initiatives which are relatively "neutral," in that they have few, if any, adverse effects on groups within or outside Andean society. For example, the Group recently began to emphasize external relations with regard to technology, particularly the adoption of common positions at international meetings such as UNCTAD VI, and the fostering of technical cooperation with other LDCs (JUNAC, 1979c, 50-51, 57; JUNAC, 1983b, 35-36); such activities are to be continued under the new strategy (JUNAC, 1983c, 22-23). In addition, there appears to be a new emphasis within the overall policy on "pure" scientific investigation, and development of human resources (JUNAC, 1983c, 17-18), although the main emphasis is still on "applied" technology. Finally, the shift in emphasis from regulatory to programming activities may also indicate a favouring of activities which are more "neutral," particularly in terms of their effects on external economic interests.

The extent of the changes should not be exaggerated.

There is a great deal of continuity with past policies. PADT activities are being maintained and in some cases expanded (see Chapter V), and the programs of technological disaggregation, inventory of technological capacities, and international technology search are still in progress, although they appear to be developing at a very slow pace (JUNAC, 1983b, 7-8). Nonetheless, changes are evident. As in previous phases, they are linked to political-economic conditions in the subregion.

D.1. Contextual Factors

To begin with, as in earlier phases, it is necessary to examine the influence of progress in the Andean Group generally on the evolution of the common technology policy. Just as the climate of enthusiasm during the late 1960s and early 1970s helped spur the birth of the original common technology policy, so the decision in the present decade to attempt to "reactivate" the integration process is partly responsible for the current expansion of technology policy proposals. There is, however, a crucial difference between the two periods. While in the initial phase technology policies were seen as responding to demands posed by the integration process (see Decision 84, Preamble), at present the relationship is reversed: technology policy is increasingly being used as a vehicle through which to promote integration on a wider front. This fact highlights the fragility of the current "reactivation" of the Andean integration process: as agreement on broad economic policy issues (industrial

programming, trade liberalization) has become more problematic, the Group has turned to more specific (and in a sense "neutral") areas of action (physical integration, external relations, technology generation) to "carry" the integration process. (The problems arising from this situation are dealt with in more detail in Chapter V.)

Other contextual factors are also important. The Junta has mentioned two such factors. First, it stresses the need to increase agricultural productivity, as a result of population increase and continued rural-urban migration, as one reason behind the new emphasis on the agricultural sector in all of the Group's policies (JUNAC, 1983c, 12-13). Second, it mentions the new importance of science-based technologies (micro-electronics, bio-technology) as one reason for an increased emphasis on scientific investigation and training within the overall technology policy (JUNAC, 1983c, 11-12). While both of these factors are important, they are not the only (or even the primary) influence behind recent changes in policy direction.

A more important set of contextual factors are those arising from changing global economic conditions. The third phase is characterized not so much by the advent of new economic trends, but rather by a continuation of trends which began during the second phase, in particular the growing external public debt of member countries. In recent years, the seriousness of the debt problem has been aggravated by several other factors: rising interest rates as a result of the tightening of the U.S.

money supply; the advent of protectionist sentiments and policies in the AICs; and slack domestic demand in AICs, resulting in falling primary commodity prices (Iglesias, 1982, 154-155). As well, stagnant or declining oil prices in recent years have meant that debt problems now also afflict the oil-producing member countries, Venezuela and Ecuador (see IL, abril de 1982, 96-100; mayo de 1982, 134-137).

D.2. Indirect Actors -- Social Forces

Similarly, changes in underlying social forces which began in the second phase have continued in the present phase. In particular, the relative stagnation of the industrial sector noted in the previous section has continued in the 1980s, and become more widespread. Table III.5 shows that between 1980 and 1982, manufacturing production grew at a slower rate than GDP as a whole in all the Andean countries except Ecuador; in four of the six countries, moreover, manufacturing output fell in the 1980-82 period. These changes parallel reforms to national economic policy: the relative weakening of the manufacturing sector is least severe in Ecuador and Venezuela, which were the last Andean countries to abandon ISI policies. The influence of local industrial interests has been further weakened by a continued and expanded shift toward "open" economic strategies: Malave Mata (1982, 104) contends that the neo-liberal policies of the Herrera Campins government in Venezuela have reduced the strength of the local industrial bourgeoisie by stimulating DFI

and promoting a concentration of economic activity which has resulted in the bankruptcy and marginalization of small and medium enterprises.

Foreign capital, on the other hand, has been afforded increased influence by the shift in economic strategy; Gorman and St. John (1982, 194) note that the Belaunde government's economic strategy is "dependent on the goodwill of the U.S. and the international financial community." Nonetheless, the type of blatant external opposition to elements of the common technology policy which was evident in the early and mid-1970s is no longer prevalent. This is partly due to the fact that many policies directly affecting external interests (Decision 24, Decision 85) have been weakened by revisions and/or lax implementation; another factor, however, is the very existence of local businessmen allied with foreign capital, and in a sense acting as its local "representatives" (Malave Mata, 1982, 102).

D.3. Direct Actors

The relative weakening of industrial interests, combined with the various changes in contextual factors noted earlier, is at least partially responsible for the continuation of the regime changes which began in the early to mid-1970s. The election of Belaunde in Peru and Herrera Campins in Venezuela meant that by 1980 most of the Andean countries had adopted a development strategy based on export promotion, a reduced economic role for the state, and expanded links with foreign economic interests. A

1980 article argued that "Ecuador is now virtually the only country in the group which remains true to the original philosophy of the pact" (LAWR, Dec. 19, 1980, 10), and even Ecuador's commitment to the nationalist development model of the early 1970s is questionable. The extent of the shift in economic strategy is perhaps reflected in the fact that by 1983, Colombia's Minister of Economic Development was citing the need to "create the conditions" under which Chile could re-join the Group, arguing that Chile's withdrawal had been the result of "excessive restrictions" on DFI (IL, abril de 1983, 77).

The continued shift in economic strategy has had two effects. First, unlike the previous period, in which conflicts over development strategy largely paralyzed the integration process, there is now a substantial consensus within the subregion upon issues of broad economic policy; as a result, agreement on integrative measures (including technology policies) is more likely to be forthcoming. This consensus, of course, is not absolute; as Puyana de Palacios (1982, 60-68) points out, differences in the level of economic development of the member countries will always give rise to certain differences in development strategy. However, conflicts among the member states since 1980 have not for the most part been related to divergent economic philosophies, unlike the 1974-1976 conflict. Rather, they have been of two types: first, political-diplomatic conflicts, such as the Peru-Ecuador border conflict which re-emerged in 1981, or the isolation of Bolivia following the

1980 coup; and second, conflicts related to the use of short-term emergency economic measures by regimes with similar development strategies, such as recent disputes arising from the increasing incidence of unilateral protectionism by Group members (LARR-AG, Jan. 28, 1983, 2; March 4, 1983, 8; May 20, 1983, 1-2). Such conflicts undoubtedly have a negative effect on progress within the Group, including agreement on technology policy issues. This effect, however, is likely to be more temporary and less severe than that caused by conflicting development strategies.

Second, the regime changes have engendered changes in the economic strategy of the Andean Group itself. Beginning in 1981, both the Junta and the Commission published documents which called for a "reactivation" of the integration process (JUNAC, 1983a), largely via modifications to the Group's economic strategy. While such modifications are not yet complete (and in some cases have not yet been approved), it appears that the Andean Group is developing a new integration "model," which parallels current national development strategies. First, the Group is revising its former emphasis on industrialization via ISI policies, in favour of a reliance on the agricultural and extractive sectors: in 1982 the chairman of the Andean Commission stated that "when the integrationist formula emerged twelve years ago, large-scale industrialization was a focal point of interest, whereas, these days, more importance is attached to the agricultural, financial, mining and services sectors" (CE, Feb 1982, 58; see also CE, Oct. 1982, 374; Oct. 1981, 445-448).

Second, national strategies which envision a limited state role in the economy have been accompanied by the virtual curtailment of some of the more ambitious policies of the Group, particularly its industrial programming activities (LARR-AG, Aug. 27, 1982, 4); by 1983, none of the four PSDIs had been adequately implemented (JUNAC, 1983a, 73), and by August 1983 the automotive PSDI had been cancelled (IL, agosto de 1983, 70-71). Finally, there have been repeated calls, mostly by Peru, for further revisions of Decision 24 (LARR-AG, June 24, 1983, 1-2; Jan. 28, 1983, 2; Oct. 3, 1980, 1). Most of the revisions sought by the Belaunde government relate to DFI, but some apply to those provisions of Decision 24 dealing with technology transfer; in particular, there have been calls for liberalization of the restrictions on the payment of royalties to foreign parent companies by their subsidiaries (LARR-AG, June 24, 1983).

Thus, changes in national regimes have brought about a situation in which agreement on technology policies is more likely than in the previous period, but in which the nature of policies proposed is likely to differ from that of the original common technology policy. This, it seems, is the primary explanation for the recent "rebirth" of the Group's technology policy, and its altered orientation; it also explains why, unlike the situation during the second phase, changes are now occurring in formal as well as effective technology policy.

E. CONCLUSION

Several qualifications must be added to the analysis presented above. In the first place, the three phases are not clear-cut, and in many instances there appears to be a considerable lag between political-economic changes and policy modifications. Second, all of the changes in the Group's technology policy over the past fourteen years cannot be attributed solely to political-economic influences. Numerous authors have stressed the extent to which problems of implementation of certain policies have resulted not simply from a lack of support for these policies at the national level, but also from administrative inadequacies and divergent interpretations (Mytelka, 1979, 64-65; Puyana de Palacios, 1982, 186-187; Vargas-Hidalgo, 1979, 221-222). Similarly, many of the changes proposed in recent years (e.g., selection of priority areas for action) result largely from a recognition of problems which impeded the progress of the technology policy in the 1970s. Moreover, personal factors have at times influenced the common technology policy. Warhurst (1983, 281) notes that the success of the copper PADT is in part due to the efforts of individuals committed to the project; at a broader level, the reorientation of the Group's technology policy in recent years can perhaps in part be linked to personnel changes in the Junta and its technology policy group.

Nonetheless, it is possible to isolate three stages in the evolution of the common technology policy, each corresponding to a different set of political-economic conditions. In the next

two chapters, two specific elements of the overall policy -- Decision 24 and the PADTs -- have been singled out for closer analysis. In each case, the way in which the policy has evolved, and its success since inception, result largely from changing political-economic factors. The characteristics of the policy instrument in question, however, are an important mediating force, structuring the impact of these political-economic factors.

NOTES : CHAPTER III

(1) There are indications that AIC economic growth had begun to slow down before 1973, but it is reasonable to assume a delay before the effects of this slow-down on trade would be felt.

(2) The lack of competition between local and foreign capital is illustrated by data on Venezuela collected by Matos (1977, 289). In a survey of 21 TNCs active in the Venezuelan manufacturing sector (various product lines), Matos found that most foreign subsidiaries are in competition not with local firms, but with other subsidiaries of TNCs: only five of the 21 firms mentioned Venezuelan companies as among their principal competitors.

(3) The strength of FEDECAMARAS is perhaps the primary reason for the late date at which nationalist policies came to the fore in Venezuela. It was only in 1973 that the Perez government put forward a "nationalist" strategy, culminating in the nationalization of foreign-owned oil companies. Even then, according to Petras and Morley (1978, 164), this was due not so much to a weakening of oligarchial power as to the influence of contextual factors (Venezuela's ties with OPEC, favourable financial conditions caused by rising oil revenues).

(4) Unanimity among the various elements of the Chilean business elite appears to have been short-lived. Remmer (1979, 454-455) notes that by the late 1970s support for the Pinochet regime among Chilean manufacturing interests had declined, as the negative effects of the regime's policies became evident.

(5) Strictly speaking, Malave Mata's arguments cannot be tested using figures dealing with sectoral distribution of GDP, since such figures are affected not only by the size of investments in various sectors, but also by the differing productivity of these investments. Data on sectoral distribution of gross fixed capital formation give a clearer picture, and at least partially support Malave Mata's arguments. In 1960, the tertiary sector accounted for 47.9 percent of capital formation in Venezuela; this had risen to 63.4 percent in 1970, and 72.1 percent in 1979, but fell to 60.8 percent in 1980 (UN, 1971 and 1981). Unfortunately, the figures are not strictly comparable, since in the data for 1970 onward, construction is included in the service sector. Figures for other Andean countries are not available.

(6) Policy changes in Chile and Colombia perhaps correspond to two variants of the "opening up to the exterior" (export-oriented growth) model, referred to by Pinto (1980,

37-40) as the "ideological" and "pragmatic" approaches. The Chilean case is consistent with the first variant: new policies followed by the Pinochet regime represented a radical break with the past, and brought changes in a wide variety of policy areas. In Colombia, on the other hand, policy changes were more limited: while export promotion measures were instituted, little attempt was made to liberalize import restrictions, and support for Decision 24 (in principle) was maintained. Moreover, the policy shift was more gradual than in Chile, and never completely replaced ISI policies; this brings to mind Hirschman's argument that an export drive is, in effect, the last stage of the ISI process (Hirschman, 1971, 119-120).

(7) Unlike Decision 84, the new strategy makes no explicit mention of the need to reduce technological imbalances among member countries. Such a clause, however, was only added to the final version of Decision 84 as a result of pressure from Ecuador (Guerrero Cordero, 1979, 166-67); it is possible that a similar situation may occur during negotiations regarding the new Programa.

(8) The concrete effects of this change in emphasis should not be exaggerated. In a study of technology policies in various less-developed countries (including Colombia, Peru and Venezuela), Sagasti (1978, 77) noted that the countries in the study "have not paid much attention to the design and use of policy instruments" geared toward the promotion of innovation within existing enterprises.

CHAPTER IV : REGULATION OF TECHNOLOGY TRANSFER (DECISION 24).

A. INTRODUCTION

As mentioned in Chapter II, the Andean Group's statute on foreign investment and technology transfer (Decision 24) is by far the most widely publicized element of the common technology policy. Even in this case, however, information on support for the policy is relatively scarce, and in most cases fails to explain variations in patterns of support or opposition among different groups/classes. Studies by Ferris (1979a, 1979b), for example, deal exclusively with "national" support, treating each member country as a relatively homogeneous entity; similar but more qualified criticisms could be levelled against the analyses of Mace (1981) and Tironi (1978c). Even when various components of a "national" position have been isolated, few attempts have generally been made to understand the complex patterns of support/opposition within specific groups/classes (1).

This chapter analyzes patterns of support for regulation of technology transfer among the local business elite ("national bourgeoisie") in three Andean Group countries: Colombia, Ecuador, and Peru. The first section provides a brief background to Decision 24, and introduces two hypotheses to be tested. Results of empirical tests are presented in the next section, followed by an explanation of these results. In the final section, an analysis is made of the relationship between perceived patterns

of support and the success and/or failure of Decision 24, as well as its evolution since 1970.

B. BACKGROUND

The theoretical basis of Decision 24 has already been outlined (see Chapter II, Section B.4). While Decision 24 deals with both foreign investment and technology transfer, it is with the latter that this study is concerned. With regard to technology transfer, the primary purpose of Decision 24 is to compensate for imperfections in the market for imported technology, by strengthening the bargaining position of local firms in their dealings with foreign technology suppliers (Mytelka, 1979, 64). To this end, Decision 24 establishes a screening process for all technology contracts (licensing agreements, etc.), to be administered by a designated "competent authority" in each member country; approval is to be based on an assessment of the "effective contribution" to the subregion of the technology in question (Article 18) (2). In addition, Decision 24 sets out certain minimum requirements for the content of all technology contracts (i.e., they must specify the form of the transfer, the contractual value of all elements of the transfer, and the duration of the contract), and forbids the imposition of various types of restrictive clauses (export restrictions, tie-in clauses, etc.) (Articles 19 and 20). In this way, Decision 24 is intended to reduce the duration of contracts, lower royalty payments, and decrease the incidence of

restrictive clauses. Finally, Decision 24 states that "intangible technological contributions" may not be counted as capital contributions by foreign firms, and prohibits the payment of royalties by foreign subsidiaries to parent companies (or other affiliates) for such "intangible technological contributions" (Article 21). (These last two points, while undoubtedly important, are not of direct concern to the present chapter, which deals with the purchase of foreign technology by domestic firms with little or no foreign equity participation.)

Given the nature of the statute's provisions on technology imports, it could be expected that Decision 24 would receive strong support from the local business community; as Chudnovsky (1981, 134) points out, such an assumption appears to have guided most attempts by LDCs to devise regulations governing technology transfer (see also UNCTAD, 1980a, 1). Such support, moreover, is crucial to the success of Decision 24. Since the statute is a regulatory policy, which must be incorporated into the national legislation of each member country (see Chapter II), a strong business constituency supporting such legislation is needed; this need is made all the more pressing by the peripheral influence of other groups (labour, etc.) on the Andean Group's technology policy. Business support is also needed to ensure that the statute's provisions are not bypassed through "gentlemen's agreements" and other tacit arrangements between technology suppliers and purchasers (Chudnovsky, 1981, 143-144).

Recent evidence, however, indicates that substantial variations in business support do exist (3). In particular, Mytelka (1979, 93-96) argues that support for regulation of technology transfer varies considerably, depending upon the ownership structure of the firm in question (i.e., foreign, domestic or government ownership) and its country of origin. In a more recent article, Chudnovsky (1981, 143-147) contends that the accepted notion of local business support may not hold true in certain cases. According to Chudnovsky, most predictions regarding local business support for regulatory measures assume that technological inputs are purchased in order to decrease costs, increase product quality, or introduce new products. As a result, the opportunity to reduce the cost of such inputs will be welcomed by local firms. In at least two cases, Chudnovsky argues, this assumption may not hold true. First, if the recipient firm holds a large share of the internal market for the product produced with imported technology, it may wield enough market power to enable it to pass on to its customers part or all of the cost of imported technology; as a result, it will be relatively disinterested in a screening process aimed largely at reducing the costs (direct and indirect) of technology transfer. Second, if the recipient firm operates in a market where non-price competition prevails, it may be interested in foreign technology for the competitive advantage it can supply, in the form of a foreign trademark or brand name. Again, a local firm in this position would be more interested in securing supply than

in reducing the cost of imported technology, particularly if it were in competition with TNC subsidiaries with ready access to the proprietary technology of their parent companies.

Drawing upon Chudnovsky's observations, two hypotheses can be formulated regarding the support of local industrialists for the regulation of technology imports:

- i) there is a negative relationship between a firm's share of the domestic market and its support for regulation of technology imports; and
- ii) firms which purchase technology largely because of the competitive advantage to be gained from a foreign trademark or brand name will be less supportive of government regulation than other firms, other things being equal.

The following section deals with empirical tests of these two hypotheses.

C. EMPIRICAL TESTING AND RESULTS

In order to test these two hypotheses, data gathered by Mytelka in a 1975 survey of 90 chemical and metalworking firms in Colombia, Ecuador and Peru were used. Since Chudnovsky's hypotheses refer only to what he labels "independent" firms (i.e., those without foreign equity participation), analysis was limited to three types of firms: national private corporations (80 per cent or more national ownership), national family firms, and subsidiaries of national firms. Government corporations and firms with more than 20 per cent foreign ownership were treated as special cases to which the hypotheses do not necessarily

apply. This reduced the sample size to 57 respondents (32 national private firms, 22 family firms, and 3 subsidiaries).

The data collected by Mytelka have several advantages for the present analysis. In the first place, as Mytelka (1979, 76) notes, the survey covers three countries "characterized by different degrees of industrialization, hence different configurations of social forces"; it also includes firms operating in a variety of product lines, of both high and low technological complexity and volatility. Both these factors should increase the ability to generalize from the results obtained in testing. As well, the firms in the survey satisfy Chudnovsky's caveat that his hypotheses apply primarily to manufacturing firms which are "mainly oriented toward the internal markets" (Chudnovsky, 1981, 134, fn. 2): of the 57 firms in the survey, 31 did not export at all, and the average annual value of exports was only 9.9 per cent of the total value of production.

On the other hand, there are some weaknesses in the data chosen. In particular, as Mytelka (1979, 76-77) herself notes, the survey is not a random sample of all manufacturing firms in the three countries. Instead, it represents (with a few exceptions) the universe of firms in 10 product lines within the chemical and metalworking industries: fibres, plastics, paints, soaps, chemicals, electrical machinery, industrial machinery, foundry parts, machine tools, and finished metalworking goods. Thus, the present analysis is based upon a close approximation to the universe of "independent" domestic firms in these product

lines (with the proviso that no independent firms were active in the fibres product line). Given this limitation, reliable generalizations to other sectors or product lines cannot be made solely from the results of statistical tests, and the analysis is primarily limited to descriptive statistics (4). In later sections, however, some analysis is made of the extent to which the results obtained may be applicable outside the sample group.

The following variables were used to test the hypotheses. First, as a measure of support for regulation of technology transfer, respondents' answers to the following question were used: "To what extent should government try to regulate the transfer of technology?"

Table IV.1: Support for Regulation of Technology Transfer

Degree of Regulation Desired	Number of Firms			
	Colombia	Ecuador	Peru	Total
No Regulation	0 (0.0%)	3 (30.0%)	4 (12.0%)	7 (15.2%)
Flexible Regulation	5 (33.3%)	4 (40.0%)	10 (47.6%)	19 (41.3%)
Stiff Regulation	10 (66.7%)	3 (30.0%)	7 (33.3%)	20 (43.5%)
Total	15 (100%)	10 (100%)	21 (100%)	46 (100%)

(11 missing cases)

The original question was framed in an open-ended manner, allowing respondents to reply at length, but Mytelka recoded the replies into three categories: no regulation, flexible

regulation, and stiff regulation. (Responses to this question, broken down by country of origin, are presented in Table IV.1.)

Second, as a measure of a firm's market power, the percentage of the domestic market accounted for by its most important product was used; values for this variable ranged from 5 per cent to 100 per cent, with a mean of 59.1 per cent. Of a total sample of 57 firms, 45 responded to this question. While the average of the firm's market share for several of its products may have been a more useful measure -- particularly in cases where the firm's most important product was not produced using foreign technology, but other products were -- attempts to create such a variable greatly reduced sample size, and hence reliability of results. Moreover, a replication of tests presented below using the average of the firm's market share for its top two products produced similar results, but with a response rate of only 26 firms.

Finally, in order to measure the importance of brand name considerations in a firm's decision to import technology, two variables were combined. The first dealt with firms' reasons for licensing technology. For the purposes of this analysis, all firms which mentioned brand name considerations as their first, second or third reason for licensing technology were treated as having "brand name" motives; other responses (i.e., prior relationship with licensor, cost, favourable bargaining conditions, technological complexity) were treated as evidence of "non brand name" motives (5). Because of the low response rate

(18 firms) for this variable, a second variable was also used, which contained responses to the question: "Apart from licenses has the firm signed contracts for the use of brand names and/or trademarks?" Thus, a composite variable was created, in which firms which mentioned brand name considerations in either variable were treated as having brand name motives for importing technology. The response rate for this variable was 56 of 57 firms; 22 mentioned brand name motives, and 34 did not.

Preliminary tests showed some support for Rhudnovsky's hypotheses, particularly that regarding brand name motives.

Table IV.2: Support for Regulation by Market Share

Degree of Regulation Desired	Share of Domestic Market, First Product		
	1 - 50%	51 - 100%	Total
No Regulation	2 (11.8%)	5 (23.8%)	7 (18.4%)
Flexible Regulation	7 (41.2%)	9 (42.9%)	16 (42.1%)
Stiff Regulation	8 (47.1%)	7 (33.3%)	15 (39.5%)
Total	17 (100%)	21 (100%)	38 (100%)

(19 missing cases)

Tables IV.2 and IV.3 present, respectively, breakdowns of support for regulation by market share (split into quarters) and by brand name versus non brand name motivation. While the results do vary in the direction predicted (i.e., support appears to vary inversely with both market share and brand name motivation), the

correlation is relatively weak, producing Kendall's Tau B coefficients of only .17 and .30 respectively.

Table IV.3: Support for Regulation by Brand Name Motivation

Degree of Regulation Desired	Type of Motivation		
	Brand Name	Non Brand Name	Total
No Regulation	4 (22.2%)	3 (11.1%)	7 (15.6%)
Flexible Regulation	10 (55.6%)	9 (33.3%)	19 (42.2%)
Stiff Regulation	4 (22.2%)	15 (55.6%)	19 (42.2%)
Total	18 (100%)	27 (100%)	45 (100%)
(12 missing cases)			

In order to check these results and allow the use of control variables, the three main variables were recoded so that all were interval variables. This was achieved by "dichotomizing" the variable representing support for regulation (i.e., reducing it to two opposite categories): "stiff regulation" was taken to represent support for Decision 24, while "no regulation" and "flexible regulation" were identified with a lack of support for Decision 24 (6). No changes were needed in the other two variables (the variable representing brand-name motivations is a dichotomous variable, while market share, when not regrouped into quarters, is an interval variable). Retesting, using a Pearson's correlation test, produced similar results to those noted above: in both cases a negative

relationship was evident, but only of low or moderate strength (see Table IV.4).

Table IV.4: Pearson's Correlation Coefficients

	Market Share	Brand Name Motivation
Support for Regulation	-.1903 (38 cases) sig. = .126	-.3306 (45 cases) sig. = .013

To this point, it has been assumed that no other factors affect firms' support for regulation. In reality, however, such support could be influenced by several additional factors. The firm's size, for example, may affect its bargaining power vis-a-vis technology suppliers, and thus the degree to which a firm is reliant upon (and hence supportive of) government action to reduce the cost of imported technology. For the purposes of this analysis, firm size has been measured in terms of total capital as of 1974 (7). In addition, those firms which are able to develop their own technology may be less supportive of government regulation, since they do not rely upon imported technology, and may well suffer an erosion of their competitive position if other firms are able to import technology at a reduced price and under less restrictive conditions. This should not be seen in absolute terms: in particular, firms with an in-house technological capability may still favour Decision 24, because of the negative effects of some of the statute's

provisions (e.g., those dealing with royalty payments between subsidiaries and parent firms) on TNC competitors. For the present study, responses to a question regarding ability to develop new product technology (recorded into dichotomous "yes" and "some or no" categories) was used. While this does not necessarily measure the ability of firms to develop process or organizational technology, it does provide some measure of a firm's technological capabilities.

With these control variables (8), the hypotheses were re-examined using a partial correlation test.

Table IV.5: Partial Correlation Coefficients
(Controlling for Firm Size and Ability to Develop Technology)

	Market Share	Brand Name Motivation
Support for Regulation	-.3085 (21 cases) sig. = .076	-.3662 (24 cases) sig. = .033

As can be seen from Table IV.5, controlling for firm size and ability to develop technology resulted in a slightly higher degree of support for the hypotheses, particularly that concerning market share.

D. EXPLANATION

Results of statistical testing thus indicate a moderate degree of support for Chudnovsky's hypotheses for the firms in the sample (although the low response rate for some of the tests

should be kept in mind). While support does vary in the direction predicted by Chudnovsky, the relationships are not as strong as might have been expected. To a certain degree, this may be due to inaccuracies and/or inconsistencies in the data; in particular, some of the responses may be characterized by what is generally referred to as "social desirability response set," with respondents providing what they perceive to be the "desired" response. This problem, however, should have been minimized by the use of open-ended questions when administering the original questionnaire, and by the use (as far as possible) of objective, rather than subjective, variables in testing.

While the possibility of inaccuracies in the data cannot be entirely ignored, two other explanations for the relatively low level of support for the hypotheses seem more plausible. First, there may be several intervening variables which affect support for regulation of technology imports, and thus indirectly limit the validity of Chudnovsky's hypotheses. The influence of one such factor, country of origin, is clearly evident from Table IV.1: support is highest in Colombia, slightly lower in Peru, and lowest in Ecuador. Mytelka (1979, 93) links this trend to two factors: the greater experience of industrialists in Colombia and Peru with "licensing and its abuses"; and the inducements offered to business by the Colombian and Peruvian states in the late 1960s and early 1970s, in order to "increase the national content of their products, to search for inputs locally, and to undertake their own research and development." It also appears

likely that the support of the local bourgeoisie has been conditioned by its prior experience with national regulation of technology transfer. In Colombia, where support is highest, a process of review of technology contracts has been in place since 1967, under the direction of the Comité de Regalias.

In order to control for the effect of this variable, the hypotheses were retested, treating each country separately. Results of a Pearson's correlation test are presented in Table IV.6 (insufficient cases are available to produce reliable results from a partial correlation test).

Table IV.6.1: Pearson's Correlation Coefficients
(Individual Countries)

	Market Share	Brand Name Motivation

Support for Regulation:		
Colombia	-.3844 (13 cases) sig. = .097	-.2312 (15 cases) sig. = .223
Ecuador	-.3466 (7 cases) sig. = .223	-.6547 (10 cases) sig. = .020
Peru	-.1439 (18 cases) sig. = .284	-.1535 (20 cases) sig. = .259

Support for the first hypothesis (lack of support for regulation as a function of market share) is slightly higher than that for the sample as a whole in the cases of Ecuador and Colombia, but lower for Peru. Support for the second hypothesis (brand naming

as an influence on support for regulation) is significantly higher in Ecuador, but lower in the other two countries. Given the small sample size for each country, the results are not entirely reliable (witness the significance figures which, in most cases, are above the accepted cut-off point of .05). They cannot, however, simply be dismissed. While the reasons for the variations in support for the hypotheses among the three countries are not clear, several explanations are possible. In particular, it may be that in the relatively more industrialized countries (Colombia and Peru) regulation of technology transfer is seen not only as a means of decreasing the costs of transfer, but also (as mentioned earlier) as a means to weaken the position of TNC competitors (since competition with TNCs is, presumably, more prevalent in these countries than in Ecuador, which is at a lower level of industrialization, and where DFI is more concentrated in certain sectors/product lines (see Tables III.2 and III.3)). As a result, Chudnovsky's hypotheses would be less applicable to the former countries. The prior existence of technology policy initiatives of various types in Colombia and Peru may also affect business attitudes in a manner not anticipated by Chudnovsky.

In addition, support for regulation may vary, depending upon the industrial sector or product line of the firm in question. There are two possible reasons for this. First, there may be significant sectoral differences in the degree to which brand naming is a means of inter-firm competition. In a study of

the Argentine pharmaceutical industry, for example, Chudnovsky (1979, 55) argues that brand naming and other types of non-price competition are considerably more prevalent than in other industries, and allow domestic firms to pass on the costs of in-house R&D and/or technology imports (9). Second, there may be variations in support for regulation, as a result of differences in the degree of foreign penetration in various sectors/product lines. In other words, when firms are confronted with competition from TNC subsidiaries, they may be supportive of government action that not only decreases their own costs (improving their competitive position vis-a-vis TNCs which, because of larger size, greater vertical integration, and easier access to new technologies, are presumably 'lower-cost producers'), but may also have direct negative effects on TNCs. This point should not be exaggerated: as mentioned earlier, Chudnovsky argues that the need to compete with TNC subsidiaries may force domestic firms to license foreign brand names and trademarks, and thus decrease their support for regulation. Moreover, established domestic firms operating in a market already penetrated by foreign capital presumably have some advantage that allows them to compete successfully with foreign-owned subsidiaries, and thus are less reliant on government action. Degree of foreign penetration may still be a factor, particularly in cases where either the domestic or foreign firm is a new entrant in the market.

At first glance, the data collected by Mytelka offer little support for this explanation: as can be seen from Table IV.7, support for regulation is similar in the two sectors studied.

Table IV.7: Support for Regulation by Industrial Sector and Product Line

Sector/Product Line	Degree of Regulation Desired			
	None	Flexible	Stiff	Total
Chemicals	3 (17.6%)	7 (41.2%)	7 (41.2 %)	17 (100%)
Plastics	0 (0.0%)	2 (50.0%)	2 (50.0%)	4 (100%)
Paints	1 (12.5%)	3 (37.5%)	4 (50.0%)	8 (100%)
Soaps	1 (33.3%)	1 (33.3%)	1 (33.3%)	3 (100%)
Chemicals	1 (50.0%)	1 (50.0%)	0 (0.0%)	2 (100%)
Metalworking	4 (13.8%)	12 (41.4%)	13 (44.8%)	29 (100%)
Elec. Machinery	0 (0.0%)	1 (33.3%)	2 (66.7%)	3 (100%)
Ind. Machinery	2 (20.0%)	5 (50.0%)	3 (30.0%)	10 (100%)
Foundry Parts	0 (0.0%)	4 (66.7%)	2 (33.3%)	6 (100%)
Machine Tools	0 (0.0%)	2 (50.0%)	2 (50.0%)	4 (100%)
Finished Goods	2 (33.3%)	0 (0.0%)	4 (66.7%)	6 (100%)
Total	7 (15.2%)	19 (41.3%)	20 (43.5%)	46 (100%)

The similarity is not entirely surprising, given the characteristics of the chemical and metalworking sectors. Brand naming (and product differentiation in general) is not an important mode of competition in either sector, and data for Colombia and Peru indicate that the two sectors are characterized by relatively similar levels of foreign ownership (see Table

III.4): in 1974, foreign firms in the chemical and metalworking industries accounted for 62.4 per cent and 58.2 per cent of production respectively in Colombia, and 38.0 per cent and 35.3 per cent of manufacturing production respectively in Peru. (The Peruvian data refer not to each industry as a whole, but rather to the average penetration figures for several product lines in each industry; as well, figures for the two countries are not strictly comparable, because of differences in the definition of "foreign" firms.) On the other hand, when results are broken down by product lines (see Table IV.7), variations in support for regulation are more striking; this reflects significant differences in both the prevalence of brand naming and the degree of foreign penetration among the various product lines covered by the data. Unfortunately, the small number of cases in each product line complicates any attempt to identify relationships, and makes it impossible to retest Chudnovsky's hypotheses for individual product lines.

As well as country of origin and sector/product line, other intervening variables may also be important. Some of these have been used as control variables, and another, unit cost of imported technology, cannot, as has been mentioned, be adequately measured using Mytelka's data. Personality variables (i.e., characteristics of individual respondents, independent of the situation of their firm) may also be a factor, but certain factors argue against this. Mytelka (1979, 95) argues that while a question regarding government regulation of DFI tapped "the

instinctive conservatism of businessmen against government intervention," attitudes toward regulation of technology imports were related to "the dynamics of a national bourgeoisie, its competition with MNCs, and its experience with technology transfer." Indeed, variations in support depending on country of origin and product line tend to discredit (but not disprove) any hypothesis regarding the influence of personality variables.

The second possible explanation for the relatively low level of support for Chudnovsky's hypotheses is that there are problems with the hypotheses themselves, which reduce their validity. At least three weaknesses are evident in Chudnovsky's hypotheses; these do not so much refute the hypotheses as indicate that their validity may be much more limited than Chudnovsky anticipates.

First, Chudnovsky appears to assume that the only benefit of regulation for domestic firms is reduction of the costs of technology transfer, both direct (i.e., royalty payments) and indirect (i.e., restrictive clauses). In reality, however, domestic firms may view the screening process as providing a whole range of benefits. In cases where domestic firms are in direct competition with TNC subsidiaries, regulation may be favoured because of its negative effects upon these TNCs (10). Firms may also favour regulation because they see it as part of a larger policy governing DFI, industrial property, and local R&D; or simply because it satisfies the "nationalistic" sentiments of the firm or its managers.

Second, even if firms can pass on the costs of imported technology to their customers, they may still be interested in regulations that decrease the costs associated with technology transfer. In this case, the screening process would merely increase the firm's profit margin, by decreasing its costs, but not the price of its products.

Finally, Chudnovsky's hypotheses assume that domestic firms view the screening process as a type of "trade-off," which brings benefits in terms of decreased costs of imported technological inputs, but also risks a reduction in the supply of foreign technology because of this same reduction in costs. Most policies regulating technology imports, however, are predicated upon the assumption that supply of technology is highly price-elastic (i.e., a reduction in price does not reduce the willingness of foreign suppliers to license technology) (see Chapter II, Section B.4). Indeed, Chudnovsky (1981, 140-143) himself argues that, while the work of Teece and others has challenged some widely held assumptions regarding the transfer process, the assumption of price elasticity of supply generally holds true (see also UNCTAD, 1980, 8-13). The relevant variable here is not objective (i.e., to what degree is the supply of technology price elastic), but rather subjective (i.e., to what degree do local businessmen believe in the assumption of price elasticity of supply). It may be that, in the early years of the screening process, local industrialists' support is limited by their fears of a restriction of access to imported technology;

later, as the effects of regulation become more apparent, support may begin to increase.

E. SIGNIFICANCE

While care must be taken in analyzing the above data, particularly in view of the low response rate for some of the tests, some conclusions can be drawn. It appears that only moderate support exists for the hypotheses outlined above, based on Mytelka's data: there are several potential weaknesses with the hypotheses, and their validity is reduced by a number of intervening variables. On the other hand, there appears to be considerable support for the more general argument put forth by Chudnovsky (i.e., the support of local business interests for regulation of technology transfer is not homogeneous). The data collected by Mytelka indicate that support for regulation is relatively strong among local industrialists (in the sectors and product lines studied), but varies in accordance with several factors. These variations, however, are too complex to be explained totally by Chudnovsky's hypotheses, which provide only a partial explanation of observed patterns of support.

As mentioned at the outset, the results presented above cannot necessarily be generalized to other countries or industries, since Mytelka's survey does not constitute a random sample of firms. In particular, results might differ considerably if the sample included industrial sectors where brand naming is more prevalent, or where the degree of foreign

penetration is more varied. Nonetheless, Mytelka's choice of a variety of countries and product lines enhances the validity of the results obtained. To the extent that these results can be generalized beyond the present sample, they provide some important insights into the successes and failures of the Andean Group's attempts to regulate the technology transfer process.

First, the relatively high degree of support for regulation of technology imports, as opposed to that for regulation of DFI (see Mytelka, 1979, 94-95) helps to explain both the longevity of the screening process and its relative success. Unlike regulations on DFI, which were relaxed in 1976 and have been criticized many times since, the Andean Group's regulations regarding technology transfer have remained relatively intact since 1970.. In addition, various sources indicate that they have to a large degree attained their objectives: a 1979 Junta document argued that Decision 24 had resulted in the elimination of most restrictive clauses in technology contracts, and had also reduced the direct costs of transfer (11) and the average duration of contracts (JUNAC, 1979c, 13-14). Other analyses note similar successes, although they are often considerably more critical than the Junta (see, for example, Correa, 1983, 27-33).

Second, the fact that support is not uniform among industrial interests helps to explain the different success rates of various elements of the transfer of technology regulations, and the fact that such regulations, while never substantially

revised, have in some cases been bypassed through various types of "gentlemen's agreements." Correa (1983, 31-32), in a review of regulations governing technology transfer in various Latin American countries, concludes that, while regulations have been particularly successful in reducing the direct cost and duration of technology contracts, benefits are less certain in terms of the reduction of the incidence of restrictive clauses in these contracts, and particularly unclear in terms of the effects of regulation on the technological capabilities of domestic firms. Gonzalez-Vigil (1982, 82-83), in a study of the Peruvian food processing industry, notes that the number of restrictive clauses in technology contracts decreased considerably between 1970 and 1976; even in the latter year, however, (when Decision 24 was supposedly being applied in Peru), technology transfer contracts still contained a variety of restrictive clauses, including some expressly prohibited by Decision 24. It appears that, while support for regulation has never decreased to a level where pressures for revision of Decision 24's technology transfer provisions could become significant, the variations in support noted in this chapter have had an effect, with some firms disregarding the provisions of the statute, either overtly or covertly. Such a situation is exactly that predicted by Chudnovsky (1981, 143-144), who argues that variations in support will result in a relatively "cautious" attitude toward regulation of the transfer process:

In some cases, the terms and conditions approved by the competent authorities might be bypassed by other means

[than outright opposition], like "gentlemen's agreements." In other cases, recipient firms might object to some of the terms and conditions imposed by the government, and a tacit acceptance of some restrictive practices should follow."

Unfortunately, accurate measurement of the extent to which this has occurred is difficult, if not impossible.

Third, variations in support among the three countries surveyed provide a partial explanation of the most persistent problem of Decision 24 (and other regulatory policies approved by the Andean Group): inconsistent application at the national level. Since regulatory policies must be set in motion through their approval in each member state, support of the local business community is crucial to the success of such policies (see above, Section B). Variations in levels of business support among the member countries may thus help to explain delays in approval of the administrative machinery necessary to implement the screening process in member countries such as Ecuador (see JUNAC, 1979c, 46-48).

The significance of the results outlined above should not be exaggerated. A complete analysis of the determinants of Decision 24's success/failure, would have to examine the attitudes, not only of the local industrial class, but also of non-industrial business interests (which, as noted in Chapter III, have often been the most steadfast opponents of Decision 24), foreign technology suppliers, and recipient country bureaucrats and politicians. As well, static analysis of the attitudes of different groups would have to be supplemented with

a dynamic analysis of the way these attitudes change in response to shifting political-economic conditions (i.e., an historical analysis of the type presented in general terms in Chapter III).

Moreover, the success/failure of the screening process may in large measure be attributable to factors far removed from the calculation by local businessmen of the statute's costs and benefits. According to Alcalde (1982, 46), Decision 24 has to a certain degree been "mythified" as a pillar of the Andean integration process; as a result, even when pressures mount for reform of certain elements of the statute, there is little pressure to do away with it entirely. Thus, while Chudnovsky's hypotheses help to explain the dynamics of Decision 24, broader factors related to the position of technology transfer regulations within the entire integration process must also be considered. In the next chapter, attention is focused upon another element of the Group's technology policy, the PADTs. In this case, it will be argued, the success of the PADTs derives not from their high profile within the Andean Group, but largely from their relatively low profile and small scale.

NOTES : CHAPTER IV

(1) Some attempts have been made to disaggregate patterns of business support; for example, various authors have mentioned the rift between the anti-Decision 24 position of ANDI, the major Colombian business association, and the more favourable attitude of a smaller group of Colombian industrialists centred in the Antioquia region (Lombard, 1979, 61; Sherman, 1973, 119). Unfortunately, little attempt is made to discover the reasons for such a rift.

(2) In 1974, Decision 84 outlined more specific criteria. Screening of technology contracts was to involve an evaluation of their effects on technological development, employment, national or subregional development plans, balance of payments and national income, and the environment (Article 7).

(3) Some earlier studies also question the extent to which domestic business interests favoured Decision 24; Sherman (1973), for example, notes a coincidence of local and foreign business interests in Colombia, in opposition to Decision 24. Unfortunately, Sherman's analysis, like that of many others, deals almost exclusively with the DFI provisions of the statute: Mytelka (1979, 95), however, has argued that attitudes toward regulation of DFI and technology transfer, rather than being similar, actually show little correlation, and are shaped by entirely different forces.

(4) For some tests, number of cases and degree of significance figures are also presented; these are not intended to facilitate statistical generalizations to firms outside the sample, but rather to provide an indication of the response rate within the sample group. The data used in this chapter (including that which forms the basis of all tables) is taken from Mytelka's 1975 survey, and is available through Carleton University's Social Science Data Archives (data set ANDEAN.SSDA). The codebook is entitled "Transnational Relations and Regional Regulation: The Case of the Andean Group" (May 1977).

(5) Firms which indicate that they license technology because of "prior relationship with licensor" may, of course, be importing technology for brand name reasons; however, this response is treated as a "non-brand name" motive because of the impossibility of separating such considerations from those related to product cost, quality, technological complexity, etc.

(6) As previously mentioned, the categories for this variable were recoded by Mytelka from responses to an original open-ended question. Responses classified by Mytelka as "stiff regulation" clearly show support for Decision 24; similarly, "no regulation" responses indicate opposition to the statute. For respondents who favoured "flexible regulation," however, the

situation is not as clear-cut. The responses grouped in this category (the government should play a brokerage role, putting firms in contact with cheaper, more appropriate technology suppliers; the government should apply Decision 24 flexibly; the government should only control the technology contracts of foreign subsidiaries; the government should, only provide broad guidelines concerning technology transfer; etc.) show some support for regulation, but they fall short of unequivocal support for the specific provisions of Decision 24. As a result, "no regulation" and "flexible regulation" were grouped together in a single category, representing lack of support for Decision 24 (but not necessarily for other, less stringent forms of regulation). This points out one possible weakness of Chudnovsky's hypotheses: the diversity of regulations regarding technology transfer in various LDCs makes it necessary to specify clearly the type of regulation for which support is being measured.

(7) Value of sales is also important in assessing the bargaining power of domestic firms. Size was measured in terms of total capital alone because of the higher response rate for this variable (55 as opposed to 51 firms), and because of the high correlation between the two variables.

(8) Several other variables may also have an impact. Some of these (country, industrial sector, product line) cannot easily be treated as interval variables for use in a partial correlation test; these are examined in the following section. One further variable, which could be expected to have some influence upon support for regulation, is the unit cost of imported technology (since firms for whom the costs of technology transfer are relatively low might not wish to risk reducing supply through government intervention in the transfer process). Unfortunately, the problems of measuring unit cost of technology are numerous, and the data compiled by Mytelka do not include a reliable measure of this variable.

(9) Surprisingly, however, Chudnovsky (1979, 51) notes that pharmaceutical firms were relatively supportive of attempts by the Argentine government to regulate the technology transfer process, despite their ability to pass on costs to consumers. While this seems to contradict the hypotheses put forward by Chudnovsky in his 1981 article, support for regulation among these firms can perhaps be explained by two other factors: first, the extraordinarily high costs of technology imports mentioned by Chudnovsky (1979, 51); and second, the relatively low level of concentration in the industry as a whole (Chudnovsky, 1979, 47).

(10) On the other hand, Chudnovsky (1981, 147) argues that when domestic firms have to compete with foreign subsidiaries (which have direct access to the proprietary technology of the parent firm), technology contracts which include the

authorization of foreign trademarks or brand names may be a particularly important competitive weapon. As Chudnovsky notes in the same article, however, such a situation should be made less prevalent by the existence in the Andean Group of parallel legislation restricting DFI, which makes it more difficult for TNCs to circumvent restrictions on technology transfer by setting up subsidiaries.

(11) Chudnovsky (1982, 514, 521) also notes that in the case of U.S. manufacturing subsidiaries, available evidence for Venezuela, Colombia, and Peru indicates that decreased levels of royalty payments have not necessarily been offset by higher levels of other forms of remittances.

CHAPTER V : THE PROYECTOS ANDINOS DE DESARROLLO TECNOLÓGICO
(PADTS)

A. INTRODUCTION

The common technology policy's second area of action concerns the domestic generation and adaptation of technology. The principal activities in this area are the Proyectos Andinos de Desarrollo Tecnológico (PADTs), or Andean Technological Development Projects. The PADTs are important, because they constitute an integral element of the overall common technology policy, and because of their distinctive character as opposed to regulatory policies like Decision 24. The body of this chapter consists of four sections. In the first, the objectives and central characteristics of the PADTs are examined. The second section analyzes patterns of support for the PADTs, given these characteristics. In the final two sections, an analysis is made of the achievements and limitations of the PADTs, both in absolute terms and relative to other elements of the common technology policy.

Unfortunately, information on the PADTs is relatively scarce, the majority coming either from Junta documents, or from news items based largely on the Group's own press releases. Independent studies of the PADTs are rare; moreover, most are primarily descriptive, and in most cases are conducted by current or former Junta personnel (see Guerrero Cordero, 1979, 178-187, 321-325, 386-393; Lluch Soler, 1979). An important exception is

a forthcoming study of the copper PADT, carried out by Alyson Warhurst of the University of Sussex, to be published by UNIDO (Warhurst, 1983).

B. BACKGROUND

B.1 Objectives and Areas of Action

The PADTs have two explicit objectives: first, the improvement of capacities for assimilation, adaptation and generation of technology; and second, the fostering of links between research and production activities (see JUNAC, 1983b, 20). To date, four PADTs have been established: one in the area of copper recovery and production (PADT-Cobre), one regarding tropical forest resources (PADT-Reforest), one dealing with foodstuffs (PADT-Alimentos), and one concerning technologies for the rural sector (PADT-Rural). (Information on each PADT is contained in Table V.1.) A fifth PADT, planned in the late 1970s for coal mining and refining technologies, was dropped by the Junta, for unspecified reasons. In the past two years, plans have been advanced by the Junta for the development of two further programs which, while not taking the explicit form of a PADT, are similar in nature: first, an extension of the activities of the PADT-Cobre to other non-ferrous metals; and second, an energy program dealing with planning of energy development, the production of capital goods for the energy sector, and the development of new and renewable energy sources.

According to the Junta, PADTs have been established in

TABLE V. 1 : PADTs -- General Information

Name	Date of Approval	Participating Countries	Objectives	Major Activities	Cost (1975-81)	Remarks
PADT-Cobre (Decisions 86 and 87)	1974	Bolivia, Peru, Chile*	Development of methods of extraction of low grade copper deposits, residues left behind by traditional techniques	i) extraction through acid leaching ii) extraction through bacterial leaching iii) recovery through ionic exchange and electrowinning.	\$3,011,000 (US)	Concluded
PADT-Refort (Decision 89)	1974	All member countries (excluding Chile)	Improvement of knowledge of existing forest resources Development of construction techniques using wood	i) selection and diffusion of scientific and technical info. ii) forest mapping by radar iii) study of wood for construction iv) technical assistance to industry	\$8,204,200 (US)	Projects i), ii) and iv) = completed. Project iii): first and second stages = completed; project = extended.
PADT-Alimentos (Decision 126)	1978	All member countries	Development of low-cost, nutritious foodstuffs using local materials	i) generation of intermediate foods using local materials ii) experimental production and marketing of foods for low-income groups	\$7,002,539 (US)	Scheduled for completion in Sept. 1983

TABLE V. 1 (continued)

Name	Date of Approval	Participating Countries	Objectives	Major Activities	Cost (1975-81)	Remarks
				iii) development, production and marketing of processed infant foods iv) study of opportunities for innovation in manufactured foods industry v) reinforcement of scientific-tech. info. structures		
PADT-Rural (Decision 167)	1981	All member countries	Development of technologies to improve welfare of rural population.	i) generation of systems of technology at micro-regional level ii) inventory, selection and evaluation of technologies at national and regional level	\$7,714,350 (US) (projected)	Scheduled to begin activities in 1983 (Projected duration = 42 months)

* Chile was not a full participant in the PADT-Cobre, but acted in a support role, helping to train Bolivian technicians. See Guerrero Cordero, 1979, p. 390.

Sources : JUNAC, 1979c; JUNAC, 1983b; Guerrero Cordero, 1979; Lluch Soler, 1979; text of Decision 167, reprinted in Banco Central del Ecuador, 1982.

"strategic" socio-economic sectors (JUNAC, 1983c, 8). In reality, however, two criteria appear to have been used to determine areas of action. First, priority has been given to areas in which there is a demonstrable need for technological improvement. For example, studies prior to the establishment of the PADT-Refort showed that the Andean tropical forest products industry suffered from some of the classic LDC technological weaknesses: low levels of infrastructure and funding, poor regional co-ordination of efforts, few links between R&D and the productive sector, and an academic orientation of much R&D (JUNAC, 1973, 5-8). The second criterion, which has rarely been made explicit, and may at times conflict with the first, is that PADTs are established in areas where they have a reasonable chance of achieving relatively rapid, concrete successes. Thus, a Junta document notes that "If care is taken in choosing priority areas [for the PADTs] ... technology can be generated efficiently and within relatively short periods of time" (JUNAC, 1976a, 28). This second criterion reflects a more general characteristic of intra-LDC integration: short-term concrete gains are needed to maintain political support for the integration process, and thus, policy initiatives tend to be instituted in areas where immediate gains can be realized (see for example, Mytelka, 1973; Mytelka, 1979, 9-14).

B.2. Common Characteristics

While there are substantial differences among the PADTs, all share certain common characteristics. Four are particularly important.

First, as Jorge Sabato points out, the PADTs are designed not simply to undertake theoretical studies, but also to carry out concrete research and production activities (quoted in Spurgeon, 1979, 40). Rather than attempting to provide overall direction for technology policy in a given sector, each PADT is intended to guide the development and application of specific technologies from the stage of initial transfer, and/or innovation, through later adaptation and modification, and finally to experimental (and in some cases commercial) introduction. In this way, it is hoped, the PADTs will help to bridge the gap between research and production which various authors have identified as characteristic of LDC economies (see, for example, Girvan, 1979, 6; JUNAC, 1976a, 10).

Second, the PADTs (particularly the first two) are largely experimental in nature; one of their implicit purposes is "to demonstrate that investment in local generation of technology is productive, advantageous and necessary (JUNAC, 1979c, 9). Thus, as noted earlier, areas of action are carefully chosen to maximize short-term benefits. In addition, PADT activities often take place on a small, almost "pilot project" scale: the PADT-Rural, for example, initiates intensive programs only in five "micro-regions" (one in each member country), although a more general sub-project applies to the subregion as a whole

(JUNAC, 1979c, 40-42). Moreover, rather than being open-ended projects, each PADT has a specific completion date, although in many cases these have been extended.

Third, participation of member countries in PADTs is voluntary. PADTs must be approved by a two-thirds majority vote of all member countries. At the time of the vote, however, any member country may withdraw from participation in the PADT, and thus be exempt from the rules governing the Project (see Decision 84, Article 15). To date, all member countries have participated in all PADTs, with the exception of the PADT-Cobre, which has involved only Bolivia, Peru, and (in a support role) Chile (1).

Finally, the PADTs share a common organizational framework. PADTs are approved by the Andean Commission, on recommendation of the Junta. Once a PADT is established, management duties pass to a "Contracting Committee" composed of representatives of each participating country, plus one official appointed by the Junta. The Contracting Committee's duties include prescription of administrative rules and procedures, conclusion of contracts for the execution of the Project (e.g., those for foreign financial assistance), direction and supervision of the Project, and administration of funds assigned to the Project (see Decision 84, Article 18). It should be noted, however, that the concrete activities of the PADTs take place largely at the national level, and often through existing institutions; few, if any, supranational bodies are created (2).

C. PREDICTED PATTERNS OF SUPPORT

Any analysis of the success or failure of the PADTs must begin with an understanding of patterns of support for the Projects -- that is, the relationship between the PADTs and the political-economic forces outlined in Chapter II. Unfortunately, information regarding support for the PADTs is practically non-existent (3). Despite this lack of reliable information, some predictions can be made regarding the political-economic determinants of the PADTs, based on the characteristics outlined in the previous section. It must be remembered, however, that the following sections deal with predicted, rather than observed, relationships.

C.1 Contextual Factors

In the first place, the small scale and flexibility of the PADTs should make them relatively impervious to changing contextual factors. While shifts in global economic conditions (e.g., increasing external public debt) will have some impact upon the willingness and ability of the Group to maintain PADT activities, the small scale of PADT activities should mean that this impact will be less than in the case of other Andean Group policies, such as industrial programming activities. As well, changes in relative commodity prices, or in the structure of production in member countries, could be expected to alter the areas of action of PADTs, but not to endanger the PADT concept itself. This same flexibility in terms of institutional arrangements and areas of action should reduce the impact of

other contextual factors; shifts in the Group's sectoral priorities, or in the nature of technological change, should merely produce changes in the issue areas in which PADTs are established, or the specific activities carried out by each Project.

C.2. Indirect Actors

At the level of indirect actors (internal and external social forces, particularly business interests), generalizations are more difficult. An analysis of the support of indirect actors for the PADTs must take into account differences in the scope of the PADTs, as well as variations in ownership structure and/or the nature of competition in the industries covered. Nonetheless, some general statements can be made.

In the first place, the small-scale, industry-specific nature of the PADTs means that their direct effects are limited to a relatively small group of economic actors (although this group is presumed to be larger in the cases of the PADT-Alimentos and PADT-Rural, because of the wider scope of their activities). As a result, patterns of support/opposition should be relatively localized, at least in comparison with policies like Decision 24, which affect all sectors of economic activity. Outside of the areas covered by the Projects, local and foreign business interests (as well as labour and other groups) should neither be supportive of, nor opposed to, the PADTs (4). This attitude of relative indifference should itself make adoption of the PADTs

more easy. PADTs are programming policies, which, unlike regulatory policies, do not need to be accompanied by national legislation (see Chapter II). Thus, PADTs may be adopted despite a lack of widespread support, as long as there is no powerful constituency opposing them, which could influence policy decisions at the subregional level.

Within the issue areas covered by the PADTs, support from business interests should be fairly widespread. Domestic firms stand to gain the benefits of technologies produced in the PADTs, since one of the objectives of the Projects is to diffuse results within local industry, often free of charge or at a minimal cost (e.g., the various training seminars and manuals employed by the PADT-Refort to instruct local builders). In addition, possible opposition from domestic firms is muted by a number of factors. First, PADTs create relatively little infrastructural machinery, and thus should not engender fears regarding the growth of the public sector. Second, unlike some policies to promote local generation of technology (e.g., Peru's ITINTEC system during the 1970s), PADTs are "voluntary": they demand neither increased in-house R&D nor financial contributions from existing enterprises. Third, the fact that PADTs deal with promotion of local technological activities, rather than the control of technology imports, should limit opposition from local firms which license foreign technology, and from foreign technology suppliers. In some cases, foreign technology suppliers may derive benefits from the PADTs, which are not oriented solely

toward local generation of technology, but also toward importation and assimilation of foreign technology, when necessary (5).

These generalizations, however, hide potentially important differences among the various PADTS, based on the characteristics of the industries covered. For example, in industries in which the competitive edge of leading firms results from access to imported technology, these firms may oppose a PADT in the hope of denying other firms access to new technologies (6). There might also be opposition in sectors dominated by local firms whose strong competitive position is at least partly the result of a lack of technological advancement in the industry as a whole, and who, therefore, fear the spread of new technologies. Such factors may play a role in the PADT-Alimentos, since, in the food processing industry, local firms are often concentrated in a few technologically unsophisticated product lines. (On the ownership structure of the food processing industry more generally, see UNCTC, 1981a.)

Similarly, since the spread of PADT technologies may reduce the competitive advantage of TNC subsidiaries, and/or the willingness of local enterprises to import foreign technology, there may be some foreign opposition to specific PADTs. The extent of this opposition should be determined by the degree of foreign "penetration" of sectors covered by PADTs, measured in terms of both degree of foreign ownership and prevalence of imported technology. While information on technology imports is

relatively scarce (7). Table V.2 provides data on levels of foreign ownership in the industries covered by the PADT-Cobre, PADT-Refort, and PADT-Alimentos, for Chile, Colombia, and Peru. Such data are not relevant to the PADT-Rural, since its activities are not limited to one industrial sector.

Table V.2: Percentage of Production Controlled by Foreign Firms

Sector	Chile		Colombia	Peru	
	1967	1978	1974	1971	1974
Food Products	n.a.	16.4	22.0	26.1	24.4
Wood & Products	n.a.	n.a.	33.5	5.4	2.4
Non-ferrous Metals	n.a.	46.7	73.5	94.3	5.9
Total Manufacturing	18.6	25.2	43.4	34.0	25.2

(Source: based on Table III.3)

Not surprisingly, two of the PADTs (PADT-Refort and PADT-Alimentos) have been instituted in industries characterized by low or moderate levels of foreign ownership. The third (PADT-Cobre) deals with an industry in which traditionally high levels of foreign ownership (see Morán, 1974; UNCTC, 1981b) had been reduced by the nationalist policies of the early 1970s, at least in Peru -- the only one of the three countries listed in Table V.2 which is an active participant in the PADT-Cobre. While this would seem to indicate that foreign opposition to

PADTs should be relatively limited, care must be taken in interpreting the data. In the food processing industry, for example, low overall levels of foreign ownership mask the almost complete dominance of certain product lines (e.g., processed milk products) by foreign capital and technology (see UNCTC, 1981a; UNCTAD, 1982b; Gonzalez-Vigil, 1982). While foreign opposition may not have been sufficient to prevent the adoption of the PADT-Alimentos, it may impede efforts to diffuse the results of the Project within the sector.

C.3. Direct Actors

Finally, support for the PADT concept from direct actors (national governments) can be expected to be both widespread and constant, at least in comparison to that for regulatory policies like Decision 24.

Support (or lack of opposition) should be promoted by several characteristics of PADTs. First, their voluntary nature means that no member country is obliged to take part in a specific PADT. Second, the specific and experimental nature of the PADTs means that member countries have only limited financial obligations, over a short period of time; further allocations depend upon the perceived success of each PADT. Financial obligations are further reduced by the large amounts of external financing associated with each PADT (see Table V.3). Third, unlike some subregional policies, PADTs set up little supranational infrastructure, most work being done at the

TABLE V . 3 : Financing of PADTs and Related Projects *

Name	Funds Approved (by source) 1975 - 81			Total	External Resources Obtained and in Preparation, 1982
	Member Countries	Junta	External Sources		
PADT-Cobre	\$1,691,000	\$220,000	\$1,080,000 (FRG) 20,000 (Bel.)	\$3,011,000	--
PADT-Refort	\$3,310,000	\$421,000	\$1,366,722 (IDRC) 2,600,000 (EEC) 506,478 (CIDA)	\$8,204,200	\$5,000,000 (EEC)
PADT-Alimentos	\$2,840,724	\$132,000	\$3,521,080 (EEC) 454,735 (IDB) 54,000 (IDRC)	\$7,002,539	--
PADT-Rural	--	\$231,400	\$84,000 (UK) 73,500 (UNDP) 57,500 (EEC)	\$446,400	\$3,875,200 (EEC)
Non-Ferrous Metals Project	--	--	--	--	143 \$2,300,000 (FRG)
Energy Project	--	--	--	--	\$467,900 (EEC)

* All figures are expressed in US dollars

Source : JUNAC, 1983b, pp. 12-13.

national level; as a result, PADTs are unlikely to provoke fears of an encroachment on national sovereignty.

In addition, support from national governments is likely to be relatively constant over time. Unlike some of the Group's policies, PADTs are not necessarily associated solely with the "developmental nationalism" philosophy outlined in Chapter III (8); as a result, they are likely to be supported by regimes of varying economic strategy. Moreover, the flexible nature of the PADTs means that they can be adapted to the changing priorities of member governments. Thus, while national governments may oppose specific PADTs, or policies contained in a PADT, they are less likely to oppose the PADT concept altogether.

D. ACHIEVEMENTS

Thus, the PADTs are a relatively "neutral" instrument, which is unlikely to engender widespread opposition among either political or business interests, or to be greatly affected by shifting political regimes or contextual factors (although there may be opposition to some specific PADTs, as a result of the characteristics of the industry covered). It is this fact which perhaps best explains the longevity of the PADTs: while changing political-economic conditions have led to a weakening of some of the Andean Group's more controversial policies (e.g., industrial programming, Decision 24), PADTs have expanded slowly, but constantly, since 1974, despite broader conflicts within the Group. In fact, PADTs (like other relatively "neutral"

initiatives) may at times be seized upon as a means of maintaining progress in the common technology policy, or in the integration process more generally, while at the same time not taking any drastic action which, because of negative effects on any country or group, could precipitate a political crisis (9).

There are two dimensions to the expansion of the PADTs since 1974. First, there has been a slow but constant growth in the number of Projects; the PADTs appear to have expanded as a result of a type of "demonstration effect," whereby the success of early PADTs acts as a stimulus to new Projects (Lluch Soler, 1979, 76; Guerrero Cordero, 1979, 321). While the discontinuation in the early 1980s of plans for a coal PADT represents something of a setback, this is offset by plans for the energy and non-ferrous metals projects mentioned earlier; already, close to \$500,000 (U.S.) has been authorized by the EEC for the energy project, and the Federal Republic of Germany has set aside \$2,300,000 in its 1983 budget for the non-ferrous metals project (JUNAC, 1983b, 13). It is not clear how many PADTs are planned for the future, but PADTs (and similar projects) have been given considerable emphasis in the Junta's recent proposals for reform of the Group's technology policies (JUNAC, 1983c, 19-20).

In addition to the expansion in the number of PADTs, there has been a parallel development in the type of activities undertaken. Salvador Lluch Soler (1979, 78) argues that there has been a progression "from activities directed toward the

better utilization of basic resources to other activities that, although related to the former, are aimed instead at meeting the primary requirements of the neediest sectors of society." This transition to a "basic needs" approach can be seen both in the orientation of newer PADTs (PADT-Alimentos, PADT-Rural), and in the shifting emphasis of some earlier Projects (the PADT-Refort, for example, has moved beyond attempts to improve knowledge of existing forest resources, and now concentrates on the housing shortage facing Andean countries). The extent of the shift, however, should not be exaggerated: the energy and non-ferrous metals projects now being planned appear to follow the earlier "model," perhaps reflecting the impact of growing external public debts. It also remains to be seen what effect the expanded scope of PADT activities will have upon the ability of PADTs to generate concrete successes, and thus upon the maintenance of political support for the Projects.

At a more concrete level, the PADTs have had success in a number of areas: assimilation, adaptation or creation of technology; creation of technological infrastructure (laboratories, etc.) and productive facilities; training of personnel; and, improvement of scientific and technological information, and dissemination of this information in the subregion. These successes are best analyzed by looking at each PADT separately.

D.1. PADT-Cobre

The PADT-Cobre, which terminated formal activities in 1981, has had relatively impressive success, particularly in Peru (Warhurst, 1983, 275). In both Bolivia and Peru, multi-disciplinary teams were set up to study existing techniques for recovery of low-grade ores (in both LDCs and AICs), and to design and operate pilot plants for such recovery. As of 1980, 35 professional personnel had been trained in Peru, and 25 in Bolivia (GA, octubre de 1980, 13). In addition, the PADT-Cobre has progressed further than any other Project in the creation of research and production facilities. Lluch Soler (1979, 73-74) notes plans for two pilot plants (one at Corocoro, Bolivia and one at Toromocho, Peru); these facilities, it should be noted, are not merely research stations, but fully-functioning productive operations, and thus fulfill the PADTs' objective of linking research and production. Several other facilities were also planned (see GA, agosto-septiembre de 1980, 12-13), but Warhurst (1983, 275-277) notes that not all such plans were carried out.

The success of the PADT-Cobre can best be analyzed by looking at two criteria: local creation/adaptation of technology, and diffusion of technologies developed during the Project. In the first place, while some of the technology used in the PADT-Cobre was of foreign origin, an impressive amount of technological adaptation and extension occurred during the course of the Project. Lluch Soler (1979, 73) states that the Toromocho and Corocoro plants were designed and built locally, in order to

adapt production operations to local conditions; in addition, local materials and equipment have been used whenever feasible, resulting in significant cost savings over imported facilities. Warhurst (1983, 272) argues that the site-specific nature of leaching technologies limits the effectiveness of external technology transfer for the PADT-Cobre; "optimisation" of the recovery process thus requires substantial local technological efforts. Second, according to Warhurst (1983, 275), "there has been an impressive diffusion of the technology [developed in the Project] to other mine sites and firms, and adaptation of it by the trained teams to other metallurgical problems." Diffusion has occurred not only within public sector facilities, but also to the private sector: Warhurst (1983, 277) notes that several local mining companies in Bolivia and Peru are considering using technologies of the type developed under the PADT-Cobre, and in at least one case have hired former PADT-Cobre personnel to supervise such operations. The most important evidence of diffusion, however, is the planned application of technologies developed during the PADT-Cobre to other industries, via the non-ferrous metals project (JUNAC, 1983b, 20-21).

D.2. PADT-Refort

The PADT-Refort (acronym for Recursos Forestales Tropicales, or Tropical Forest Resources) consists of four sub-projects, the most important of which is the study of wood for construction (see Table V.1). The first phase of this

sub-project (as well as the other sub-projects), is aimed primarily at improving knowledge of the region's forest resource-base. In terms of R&D facilities, the Andean Laboratory for Wood Engineering (LADIMA, or Laboratorio Andino del Ingeniero de Madera) has been established in Lima, Peru: this laboratory tests physical, chemical and preservational characteristics of wood varieties and conducts life-size tests of various housing designs and structural elements (Lluch Soler, 1979, 76; JUNAC, 1979c, 28). As in the PADT-Cobre, this facility is of local design and construction, as is much of the testing equipment; unlike the PADT-Cobre, however, the facility is geared toward research, not production. In recent years, equipment has also been provided to existing laboratories in the subregion, and new laboratories have been created in Bogota, Colombia, and Quito, Ecuador (JUNAC, 1983b, 30). In terms of provision of information, the PADT-Refort has developed visual classification standards for tropical woods, and has produced and distributed a number of manuals and booklets on tropical wood characteristics and wood engineering and construction, for both professional and general public use (JUNAC, 1983b, 31). Finally, as of 1979 some 40 technicians had been trained in the five member countries (JUNAC, 1979c, 28); by 1983, as many as 150 technicians had participated in seminars and training courses organized under the Project (JUNAC, 1983b, 30).

As mentioned earlier, the second phase of the Project concentrates on research into architectural and structural

designs and construction techniques. While this phase was to have been completed by now, funds to extend the project may be made available by the EEC (JUNAC, 1983b, 13). Under this phase of the PADT-Refort, a number of mini-courses and seminars have been carried out, in an attempt to diffuse knowledge generated in the Project (GA, octubre de 1981, 13). In addition, several prototypes of new housing designs have been designed and built (JUNAC, 1983b, 30); unfortunately, it is too early to gauge the extent of diffusion of such designs beyond test locations.

D.3. Other PADTs

In the case of the PADT-Alimentos and PADT-Rural, insufficient time has elapsed to permit an evaluation of their achievements. This is particularly true of the latter Project, which only initiated activities in 1983. As for the PADT-Alimentos, by March 1982 fourteen specific projects had been approved (GA, febrero-marzo de 1982, 15); these sub-projects cover a relatively wide area, dealing with both production and distribution of foodstuffs (see JUNAC, 1983b, 21-29). It remains to be seen whether the PADT has been successful in moving beyond experimental production to more widespread production and use, but plans are underway for commercial production and distribution of some of the new foodstuffs by existing private sector firms (JUNAC, 1983b, 23). A cautionary note should be added, however. While various studies have called for the introduction of processed foodstuffs using local materials (Thery, 1982; UNCTAD,

1982a, 23), pressures from local and foreign enterprises may frustrate such attempts. Dellimore and Whitehead (1978, 171-174), in a study of Caribbean agro-industry, note a reluctance on the part of local entrepreneurs to local sourcing of inputs; such opposition was most pronounced among larger enterprises, and for inputs with a higher degree of processing. In a recent UNCTAD study of attempts to introduce composite (wheat and millet) flours in Senegal, the failure of the experiment is linked to opposition from the foreign-owned milling industry, which presumably preferred the security of supply of imported inputs (UNCTAD, 1982c) (10).

E. LIMITATIONS

Despite the successes listed above, there are some important limitations on the achievements of the PADTs, and questions as to their future success.

E.1. Delays in Approval

In the first place, the effectiveness of the PADTs has been limited by delays in the approval of Projects, in some cases lasting more than three years (JUNAC, 1983c, 9). To a large degree, such delays are merely the result of bureaucratic inefficiencies. In other cases, however, delays may be linked to broader political-economic factors. As was mentioned earlier, the approval of the PADTs is made easier by the fact that they are relatively "neutral" initiatives. This does not mean,

however, that the PADTs are not affected by the general decision-making "climate" within the Group: delays in the approval of the PADT-Alimentos (which was first studied in 1974, but not approved until 1978), for example, may be linked to the general "crisis" within the Group during the mid-1970s, although pressure from local and foreign business interests may also be a factor.

E.2. Limited Scope

The most important limitation on the present and future effectiveness of the PADTs is their limited scope. Largely as a result of their "experimental" nature, only two Projects were originally established, and the number of PADTs has grown only slowly since then; moreover, in many cases PADT activities have been limited to small pilot projects. Ideally, the PADTs, with their emphasis on specific, concrete activities, should be able to foster a process of "learning-by-doing" in the subregion, thus incrementally developing technological capabilities which can hopefully be diffused to other functional areas. Unfortunately, as Mytelka (1979, 113, fn. 2) points out, the limited scope of PADT activities is likely to diminish their effectiveness as a vehicle to promote technological learning-by-doing. To a certain extent, this problem could be solved merely by expanding the number of PADTs in existence, but this is not a particularly workable strategy in the long run, for two reasons. First, it ties the expansion of PADTs to the continued expenditure of

public funds; particularly in the current era of government deficits and public debt (see Chapter III), such a strategy may be unacceptable to member governments. Foreign financial assistance for the PADTs reduces, but does not remove, this problem. Second, such a strategy does little to ensure that technologies developed in the PADTs will be adopted and diffused by private sector firms.

Instead, what is needed is an expansion of the linkages between PADTs and the productive sector, in order to generate demand for the type of activities being performed under the PADTs. While the establishment of such linkages is one of the explicit objectives of the PADTs, this has not always been achieved; Warhurst (1983, 279-283), for example, in her review of the PADT-Cobre, argues for closer ties between research and production in this field. The expansion of linkages with the productive sector could take a number of forms, ranging from relatively passive instruments of the type already being employed (courses, seminars, etc.), to financial incentives of the type used by ITINTEC in Peru, to active involvement of private sector enterprises in the planning and execution of PADTs.

This strategy entails certain dangers. First, as remarked in Chapter II, tying technology policy activities to private sector demand means that priorities for technological development will be set by the market, rather than by policy-makers. As a result, the type of activities undertaken will be limited to those which respond to current market conditions. This may prove

especially /problematic in areas where foreign penetration is high, or where certain types of monopolistic/oligopolistic competition limit demand for technological innovation. Reliance on existing demand may also act as a constraint on "basic needs" projects like the PADT-Rural, since, as Watanabe (1980, 131) notes, in the absence of land reform and other policy reforms, "basic needs" are rarely translated into effective demand. The Andean Group recognizes this danger: its technology policy activities (including the PADTs) attempt not simply to respond to existing patterns of demand for technological innovation, but rather to create a "directed demand" ("demanda dirigida"), in which private sector demand is modified by government and intergovernmental priorities (JUNAC, 1979c, 11). The continued expansion of PADTs (without abandoning them to existing demand patterns) depends largely on the ability of the Group to achieve this goal.

Second, linking research and production may mean that the private sector will be given a larger role in the planning and execution of the PADTs. While this can be expected to have a positive effect on the diffusion of PADT technologies (JUNAC, 1983c, 9), it also raises at least one danger. Earlier in this chapter, it was argued that one reason for the success of the PADTs has been the fact that they demand relatively little commitment from private sector enterprises; increased private sector responsibilities might thus decrease, rather than increase, support for the PADTs. A recent Junta document notes

just such a problem with regard to the Group's activities in the fields of technological disaggregation and inventory of technological capabilities: experiences in these areas, says the report, "have illustrated the barriers presented by the introduction of a tool of technology policy which demands greater responsibility from local businessmen in decision-making and application" (JUNAC, 1983c, 9).

E.3. "Supply-Side" Bias

Third, despite what has been said above, PADTs -- like other aspects of LDC technology policy -- concentrate on the supply of, rather than the demand for, technological infrastructure, services and information. Given the fact that technological innovation is largely demand-induced (see Chapter II), this is a particularly serious limitation.

This should not, however, be exaggerated. In the first place, the importance of supply-side problems in the development of LDC technological capabilities should not be ignored. In particular, inadequate technological infrastructure and insufficient knowledge of existing technological capabilities can act as "bottlenecks" ^Eimpeding progress toward increased technological self-reliance. Second, as outlined above, PADTs do work to a certain extent on the demand side, as do other elements of the common technology policy. Finally, and most importantly, it is important to realize the limit to which any element of technology policy can alter existing demand structures. Existing

patterns of demand are deeply rooted in the overall pattern of economic development of a society, and in the development objectives of the political-economic elite (Herrera, 1974, 27). As a result, changes in explicit technology policy, like the PADTs, cannot radically alter this pattern. Indeed, there is some doubt whether even the most far-reaching of the Andean Group's policies (Decision 24, industrial programming) can significantly change this situation.

E.4. Coordination of Policies

The final limitation on the effectiveness of the PADTs arises from the fact that they are only one element of the overall common technology policy. As such, they cannot in themselves be expected to promote technological self-reliance in the subregion. Moreover, PADTs can only be fully successful if they are implemented along with the other elements of the policy.

In 1979, the Junta reported that its technology policy activities had advanced more rapidly in terms of the control of technology imports than in activities related to assimilation, adaptation and generation of technology (JUNAC, 1979a, 56). In recent years, however, this situation appears to have changed: support for regulatory policies has begun to wane, while activities related to local generation of technology are still upheld. As was noted in Chapter III, this tendency is particularly evident in recent proposals for a reorientation of the Group's technology policy. In this climate, the PADTs may

develop increased prominence, especially since, their voluntary and small-scale nature make them relatively easy to "sell" to governments which are beginning to question their commitment to the Group's more far-reaching policies. In the long run, however, this is not a particularly promising basis for the development and success of future PADTs. A more secure basis would be one which arises from increased support for all aspects of the common technology policy, including its regulatory elements.

F. CONCLUSION

As has already been noted, the above analysis is to some degree tentative, given the scarcity of information on the PADTs. Nonetheless, it does highlight some important points. In the first place, it reinforces the contention made earlier that a thorough political-economic analysis of the common technology policy must take into account the disparate nature of its various elements. While both Decision 24 and the PADTs have been confronted by essentially the same political-economic conditions, the characteristics of each instrument define the manner in which it is affected by these conditions, and thus its degree of success/failure.

At a broader level, the analysis underscores certain points which are applicable not only ^{to} the Andean Group, but to LDC technology policy more generally:

- i) Activities like the PADTs, oriented toward the performance of concrete tasks within a definite

time-span, and operating in specific issue-areas, are often of more value than broad, generalized policies. This is particularly so in regional groupings, where concrete gains are necessary to maintain support for the integration process.

ii) This being said, it must also be remembered that PADT-type activities can only be fully successful as part of an integrated, far-reaching policy to promote technological self-reliance. Unfortunately, the Andean example also illustrates the difficulty of sustaining political commitment to such a policy.

iii) LDC technology policies must pay attention to the creation of demand for local technological innovation, in order that activities like the PADTs can overcome the problems posed by limited government funding. The challenge, however, is to promote such demand, without allowing existing demand patterns to distort priorities for technological development.

NOTES : CHAPTER V

(1) In the case of the PADT-Cobre, the non-participation of the other member countries is due to their limited reserves of copper. Bolivia too is a minor copper producer in comparison with Chile and Peru; in Bolivia, however, the PADT-Cobre deals primarily with the recovery of copper ore produced as a by-product of tin-mining (JUNAC, 1979c, 22).

(2) It is impossible to judge the extent to which the decentralized, flexible administrative structure of the PADTs has been a positive factor. Recent proposals, however, appear to reinforce (and strengthen) this characteristic. A new infrastructural flexibility in the Group's technology generation activities is recommended, entailing (among other things) the provision of incentives for the performance of R&D within existing enterprises (JUNAC, 1983c, 19-20).

(3) Some partial information is available. Pizano (1979b, 155), in a survey of 23 foreign-owned enterprises in Colombia (20 percent or more foreign equity capital participation) notes that the vast majority favour activities to support local generation of technology. Jedlicka and Rubenstein (1979, 115), on the other hand, argue that far from supporting local generation of technology, Colombian businessmen are distrustful of local technology: in a survey of managers of 25 Colombian enterprises, they found that "most managers reported a perceived worthlessness of indigenous technological resources."

(4) The establishment of a PADT in one sector could, of course, indirectly affect firms in other sectors, by denying them the benefits of a PADT (since the total number of PADTs is presumably limited); in this case, firms may lobby against specific PADTs, but not the concept itself.

(5) Elements of foreign technology have been used in at least two Projects, the PADT-Alimentos and the PADT-Cobre (see JUNAC, 1983b, 22; Warhurst, 1983, 287-293). In the latter case, however, much of the knowledge transferred came not from foreign firms, but rather from university-based scientists (Warhurst, 1983, 290).

(6) The extent of this opposition, however, would be determined by several other factors, including the rapidity of diffusion of PADT technologies, and the type of advantage provided by imported technology (i.e., product quality or price reductions vs. "brand name" advantages).

(7) Some information is available on the food processing industry, indicating a relatively high level of imported technology, at least in certain product lines (see Gonzalez-Vigil, 1982; UNCTAD, 1980b). In the copper industry,

Reduced levels of foreign ownership in the early 1970s may hide continued reliance on imported technology. Data on both foreign ownership and foreign technology in the forest products industry is scarce, but some general information can be found in IDB, 1983; McGaughey and Gregersen, 1983; or Sayn-Wittgenstein and Neilsen, 1972.

(8) This point should not be misconstrued. The PADTs are "nationalist" in that, as part of the broader common technology policy, they aim at greater technological self-reliance for the subregion. Similarly, it can be argued that the adoption of certain PADTs has been fostered by broader "nationalist" policies; the PADT-Cobre, for example, is perhaps linked to attempts by certain Andean governments in the early 1970s (particularly Chile and Peru) to assert national control over resource-based activities previously controlled by MNCs. However, the adoption of a PADT does not necessarily demand an acceptance of all the tenets of the developmental nationalism strategy (e.g., regionally-based ISI policies, restrictive attitude toward foreign economic interests).

(9) The PADT-Rural, for example, was approved in 1981, when conflicts raised by the Bolivian coup and the Peru-Ecuador border war threatened to destroy the Group itself.

(10) Other factors are also important. An UNCTAD study on dairy products processing in Peru, for example, criticizes government pricing policies which subsidize imported milk inputs (UNCTAD, 1982b, 20-22). Dellimore and Whitehead (1978, 144-145) also mention the importance of consumer preference for natural, rather than processed, products, as one possible barrier to the introduction of new products. For further information on product innovation in the food industry, see George (1976; 1979); Davis (1975); or Girling (1977).

CHAPTER VI : CONCLUSION

A. PRINCIPAL FINDINGS

In Chapter I, it was noted that the objectives of this thesis are both theoretical and practical. The principal findings of the thesis can similarly be divided into two categories.

At the level of theory, the thesis has demonstrated the utility of a "political economy" approach to the study of LDC technology policies, and of the particular framework developed for the thesis. As was argued in Chapter II, traditional analyses provide, at best, a partial explanation of the determinants of LDC technology policy, largely because of their inability to explain the ways in which underlying forces and actors influence the policy process. Such analyses are hindered by a mechanistic interpretation of the policy process, in which technology policies are seen as responses to objective, identifiable problems confronting LDCs. This approach is particularly unsuited to a dynamic analysis of technology policies, since, in the absence of changes in the "problems" themselves (i.e., technological underdevelopment and dependence), the framework cannot explain changes in policies designed to deal with these problems.

The analytical framework developed in Chapter II overcomes many of the problems associated with previous analyses. First, by separating the determinants of technology policy into three

types, the framework permits an analysis not only of the direct participants in policy debates (national governments, Andean Group bureaucrats), but also of the social forces (classes and/or interest groups) and contextual factors which constitute the policy-making environment. In this way, the framework avoids the problem of analyzing technology policies in isolation from their societal context. Second, by grounding the analysis in the concept of an unequal structure of representation of class/pressure group interests, the framework emphasizes that the state (or in this case the subregional decision-making process) is not neutral, nor are the policies which flow from it. Finally, the framework facilitates a dynamic, historical analysis of technology policies, relating policy changes to shifts in one or more political-economic determinant.

The framework developed in this thesis is not without its limitations. To begin with, the impact of personnel changes, or of the theoretical literature on the subject of technology policy (neither of which fit neatly into our three types of political-economic determinants) cannot be denied. While such influences are not necessarily automatically explained by the framework employed in this thesis, however, neither is attention to such factors inconsistent with a political-economic analysis. Second, it must be remembered that the framework is not a universally applicable theory: although the analysis presented in this thesis does contain certain policy lessons for other LDCs, extreme caution should be used in applying the framework to other

situations. Third, while the framework is able to identify specific forces and actors which influence the policy process, and to describe their influence at various points in time, it cannot accurately measure the relative influence of these forces/actors, particularly in view of the mutually reinforcing nature of the various political-economic determinants. Finally, as will be explained below, the predictive value of the framework is relatively limited.

On a more practical, policy-related level, the thesis provides some useful insights into the Andean Group's common technology policy. While some of the more specific findings have been discussed in previous chapters (see especially the conclusion to Chapter V), it is worthwhile to summarize a few of the more general conclusions.

First, in contrast to the Junta, which views the history of the common technology policy as one of incremental but continuous progress toward the goal of increased technological self-reliance (JUNAC, 1983c, 5-10), the thesis sees the evolution of the common technology policy as encompassing three distinct phases, each defined by specific political-economic conditions. The evolution of the common technology policy has been neither constant nor linear; instead, changing political-economic conditions have altered the rate of progress in the approval of policy initiatives, the type of initiatives approved, and, most recently, the objectives of the policy itself. The lesson, it would seem, is clear: policy initiatives which do not reflect

current political-economic conditions have little guarantee of effective, ongoing implementation. This does not mean that policy-makers cannot, through their actions, influence broader political-economic conditions, but it does suggest that the constraints imposed by such conditions must always be considered in policy debates, as well as in academic studies.

Second, the more detailed analysis presented in Chapters IV and V illustrates the extent to which the impact of changing political-economic conditions is structured by the characteristics of individual policy initiatives. While changes in political-economic factors have had a negative effect upon the Andean Group's major regulatory policies (e.g., Decision 24), small-scale, "neutral" policies like the PADTs have proved more resilient. On the other hand, the success of the PADTs in fostering the development of local technological capabilities may be limited if the PADTs are not adopted as part of a broader technology policy which includes regulatory instruments. Moreover, it must be remembered that even "controversial" policy initiatives like Decision 24 may exhibit considerable longevity, due to their perceived centrality to the broader integration process.

The analysis in Chapters IV and V thus cautions against over-simplification in assessing the impact of political-economic changes on various policy initiatives. In a similar vein, it also illustrates the dangers of assuming a unity of interests among any of the groups which influence technology policy. This

is particularly true of Chapter IV, which shows not only that the attitudes of the local bourgeoisie toward regulatory policies are less unified than is sometimes assumed, but also that the reasons for this variation in support are more complex than originally expected. While the analysis of patterns of support for the PADTS presented in Chapter V is more tentative, it suggests a similar conclusion: even though support for (or lack of opposition to) the PADTs is more widespread than that for Decision 24, there are indications that the attitudes of local and foreign capital, and their relative influence, may vary considerably, depending upon the characteristics of the industry covered.

B. SUGGESTIONS FOR FUTURE RESEARCH

The thesis also highlights a number of areas in which further research would be useful. Three such areas are of particular importance.

First, there is an evident need to apply a political-economic analysis to other examples of LDC technology policy. In particular, it would be rewarding to apply such an analysis to the technology policies of individual states. This would require some changes to the framework developed in Chapter II, but might also simplify the analysis, removing the problems posed by the varying impact of political economic factors in different countries. At least two cases warrant in-depth attention. First, in Peru a variety of ambitious technology

policies were adopted in the 1970s, but have in many cases since been removed. Similarly, in Argentina, a law regulating technology transfer passed in the early 1970s was substantially liberalized in 1981 (Sabato, 1981). As was noted in Chapter II, many of the factors influencing the common technology policy (e.g., mounting debt problems, the shift to liberal, "open" economic policies) have affected the entire Latin American region. As a result, it would be interesting to examine the extent to which these changes have provoked similar policy responses by various states.

Second, additional research is needed to refine the analysis presented in Chapters IV and V. More in-depth studies of various elements of the common technology policy are certainly needed. Information is particularly scarce with reference to the more recent PADTs, the technological information system (SAIT), and the programs of technological disaggregation, inventory of technological capacities, and international technology search. Studies of these initiatives should examine not only their concrete achievements, but also the way in which various political-economic factors have conditioned their success/failure. Attempts could also be made to collect further empirical data of the type employed in Chapter IV. This would involve the collection of information on other elements of the common technology policy, and on the attitudes of other actors in the policy process (e.g., foreign business interests, labour groups, national and subregional bureaucrats and politicians).

As well, some attempt should be made to collect time-series data, to examine changes in attitudes toward specific policies over time.

Third, it must be remembered that the primary purpose of this thesis has been to analyze past and present policy shifts, not to predict future trends. Indeed, given the complex and mutually reinforcing nature of the political-economic determinants outlined in Chapter II, any attempt at prediction is necessarily imprecise. Nonetheless, future studies might be able to increase the predictive value of the framework, and thus its relevance to policy-makers. In particular, an attempt can be made to identify the conditions under which specific policies are likely to be successful, thereby providing a greater degree of certainty in the decision-making process. The final section of this chapter briefly addresses this question.

C. OUTLOOK

The Andean Group's common technology policy, in its original form, consisted of a mixture of ambitious regulatory and programming policies, which aimed to increase the subregion's degree of technological self-reliance, by strengthening the position of the local industrial bourgeoisie. The policy, however, did not arise as a result of direct pressure from this class. Rather, national and subregional bureaucrats, presented with favourable economic conditions (e.g., economic expansion, low debt levels), acted to foster the growth of an incipient

industrial bourgeoisie, which was as yet too weak to be a potent political force. Thus, while the forces of local and foreign capital no doubt structured the range of options open to policy-makers, the rise of the common technology policy must be seen as an illustration of the relative autonomy of the state apparatus from underlying social forces, under certain favourable contextual conditions. Unfortunately, this meant that the original common technology policy rested on a weak, "conjunctural" basis, which could not guarantee its survival in the face of changing political-economic conditions. It is this fact which explains the changes in the common technology policy in the 1970s, leading to the current "reorientation" of the Group's activities. It also helps to explain the possible future evolution of the common technology policy.

At present, the Andean Group has revised its former emphasis on regulation of technology imports, in favour of small-scale, "neutral" programming policies (see Chapter III, Section D). Given what has been said above, a return to the "original" policy seems unlikely. Such a change would require one of two conditions: first, a dramatic increase in the influence of local industrial interests in the Andean countries; or, second, a re-emergence of "nationalist" attitudes and initiatives within national and subregional bureaucracies, supported by favourable contextual factors. At present, however, local industrialists are still a relatively weak political force in the Andean countries, who in any case do not act as a unified

national bourgeoisie; current neo-liberal policies have further eroded their influence. Moreover, many of the contextual factors associated with the stagnation of regulatory policies (e.g., rising external public debts) show few signs of abating. Finally, while proposals for cooperation among LDCs continue to gain some attention, particularly in regional fora, "open" economic policies, based upon integration with the economies of the AICs, still predominate within national bureaucracies.

As a result, the "reorientation" of the Group's technology policies described in Chapter III appears likely to continue over the next few years. The recent surge of technology policy activity in the Group indicates that technology will continue to be a focal point of the Andean integration process in the next few years. The nature of the policies adopted, however, seems likely to differ from that of the original common technology policy. For example, a recent article by three members of the Junta's technology policy group calls for the Group to move from a phase of "defensive" regulatory policies, to one of "active" programming of local technological development (Aguirre et al., 1984). It is unlikely that major regulatory policies like Decision 24 will be completely abandoned; however, the coming years are likely to see an increased emphasis on programming activities, as well as some incremental changes to regulatory policies, and considerable non-compliance with the rules established by these policies.

Promotion of local technological innovation is by no means a negative step, and has in any case always been a part of the common technology policy. In the present context, however, this new emphasis may have detrimental effects upon the Group's ability to achieve the goal of increased technological self-reliance, and upon the broader development prospects for the subregion.

First, it must be stressed that programming activities alone (especially small-scale ones like the PADTs) are an inadequate basis for the expansion and success of the common technology policy. If expanded programming activities are accompanied by a de-emphasis (if not dismantling) of regulatory policies like Decision 24, efforts to foster domestic technological capabilities may be frustrated. Not only might a weakening of regulatory policies lead to increased (and less selective) inflows of foreign technology, under more restrictive conditions, it would also frustrate attempts to promote demand for local technology. The development of local technological capabilities in the Andean subregion is still at a fledgling stage, when relatively unrestrained competition from foreign technology suppliers could be particularly detrimental. Thus, to be fully successful, supply-side activities such as the PADTs must be accompanied by demand-side activities, including regulatory policies like Decision 24, which orient users of technology toward local suppliers. While regulatory policies by themselves are insufficient to foster indigenous technological

development, they should be part of a package of policies designed to promote such an end.

It might, of course, be argued that concentration on small-scale activities like the PADTs will foster a gradual expansion of technology policy activities more generally (including regulatory instruments), in accordance with the neo-functionalist integration theories of Haas and others (i.e., "integration by stealth"). The nature of the PADTs, however, is such that they create neither a cadre of regional bureaucrats committed to further integration (since PADT activities are usually carried out on a national basis), nor widespread public support for integrative measures (because of their small-scale and technical nature). As a result, there seems to be little chance that the PADTs will promote a "spill-over" of cooperative activities into new areas, although the number of PADTs in existence may increase.

Second, the shift in the common technology policy must be seen as part of a broader change in the Andean Group and its member countries toward more open, liberal economic policies, combining receptiveness to foreign capital, a reduced economic role for the state, and a new emphasis on agriculture rather than industry (see Chapter III, Section D.3). In this environment, recent technology policy initiatives, far from promoting increased technological self-reliance, may (at least in part) lead to increased penetration of the subregion's economy by foreign technology. In this way, the Andean Group's revised

technology policy may prove yet another example of the situation, noted by Vaitsos (1983, 8), in which regional integration policies become a vehicle for the "denationalization" of LDC economies, increasing their degree of external dependence. Redressing this trend would require not only a renewed commitment to the regulatory elements of the common technology policy, but also the adoption of various economic policies aimed at maintaining a significant degree of domestic control over the economy more generally.

ANNEX I : MAJOR ANDEAN GROUP TECHNOLOGY POLICIES

Decision Number	Date	Title and/or Description
Decision 24	1970	"Common Treatment for Foreign Capital and Trademarks, Patents, Licensing Agreements and Royalties." Sets out rules for review of foreign investment proposals, technology contracts.
Decision 57 (1)	1972	Sectoral Industrial Development Program for the light engineering (metalworking) industry.
Decision 84	1974	"Bases for a Subregional Technology Policy." Sets out objectives, organizing principles for Group's activities in the field of technology.
Decision 85	1974	Sets up common system of industrial property rights (i.e., patents, etc.).
Decisions 86/87	1974	PADT-Cobre. Technological development project aimed at recovery of low-grade copper ores.
Decision 89	1974	PADT-Refort. Technological development project for tropical forest products industry.
Decision 91 (1)	1975	Sectoral Industrial Development Program for the petrochemical sector.
Decision 103	1976	Revisions to Decision 24.
Decision 120 (1)	1976	Sectoral Industrial Development Program for the automobile industry.
Decision 126	1978	PADT-Alimentos. Technological development project for food

processing and distribution industries.

Decision 154	1980	Creation of Sistema Andina de Informacion Technologica (SAIT), or Andean Technological Information System, a computerized information system to support other technology policy activities.
Decision 160 (1)	1980	Sectoral Industrial Development Program for the iron and steel industry.
Decision 162 (1)	1980	Sectoral Industrial Development Program for the fertilizer industry.
Decision 167	1981	PADT-Rural. Technological development for rural sector.
Decision 179	1983	Sets up two new technology policy institutions:
i) Consejo Andino de Ciencia y Tecnologia (Andean Council on Science and Technology); and
ii) Fondo Andino de Desarrollo Cientifico y Tecnologico (Andean Fund for Scientific and Technological Development).

(1) Industrial programming policies; these are listed here because they are elements of implicit technology policy.

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The following sources are cited several times in the body of this thesis. As a result, they are identified by abbreviated versions of their authors or titles, as follows:

- AG -- Andean Group
- AR -- Andean Report
- CE -- Comercio Exterior de Mexico (English edition)
- GA -- Grupo Andino
- IDB -- Inter-American Development Bank, Economic and Social Progress in Latin America (yearly)
- IL -- Integración latinoamericana
- INTAL -- IDB/INTAL, Ibs Latin American Integration Process (yearly)
- LA -- Latin America
- LAER -- Latin America Economic Report
- LARR-AG -- Latin America Regional Report --- Andean Group
- LAWR -- Latin America Weekly Report
- UN -- United Nations, Yearbook of National Accounts Statistics

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